ELECTRIC LIGHT & POWER

EL&P

Volume 68, Number 11
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

A German official announced plans to close five eastern nuclear units and may halt building six others of Soviet design.

The first battery-powered bus in a mass transportion demonstration project debuted in Allentown, PA, Oct. 23. Sponsors are the state energy office, Pennsylvania Power & Light, Philadephia Electric, Metropolitan Edison, Pennsylvania Electric and Duquesne Light. A transit authority will operate the 16-passenger bus—made by Electric Vehicles S.A.—as a shopper shuttle.

Kansas City Power & Light Co. extended the $875 million-tender offer for Kansas Gas and Electric Co. until Nov. 30. About 47 percent of KG&E common stock had been tendered, KCP&L said.

PP&L is Utility of the Year

BARRINGTON, IL—Pennsylvania Power & Light Co., headquartered in Allentown, PA, has been named Electric Utility of the Year for 1990. The company is the 22nd utility to be selected for the annual honor, initiated in 1969.

PP&L was selected for outstanding performance on behalf its three publics...customers, employees and shareholders. Selection of the company was by the *Electric Light & Power* editorial staff after an extensive review of the entire investor-owned segment of the electric utility industry.

See *EL&P's* complete report on Pennsylvania Power & Light, Electric Utility of the Year, p. 19.

"PP&L has performed well for its customers over a long period of time," said *EL&P* Editor-in-Chief Robert Lincicome, "and has played a strong role in supporting and developing the economy of its service territory. It has been a leader in using marketing programs to reduce its costs and provide additional value from its service in the highest tradition of the industry."

The utility's earnings, dividends, stock price and book value were at record levels at the end of 1989, and its cash flow is among the industry's highest. These performances illustrate the level of the company's financial recovery from the period when it was constructing its $4-billion two-unit nuclear plant, Susquehanna.

Large service territory

Pennsylvania Power & Light serves more than 1.1-million customers in a 10,000 square-mile area in East-Central Pennsylvania. It posted record years for earnings in 1988 and 1989 and is well-positioned to continue growth for the balance of the '90s.

For 1989, PP&L earned $4.05 per share, an 8.58-percent gain, 22nd best among the Top 100 investor-owned electric utilities. The company's net income of $353.4 million reflects an improvement of 6.4 percent from 1988.

The last base rate increase granted PP&L was in 1985. In fact, rates this year are lower than they were in 1986. PP&L has pledged it will not ask for another rate hike before 1993, which will make it eight years between increases.

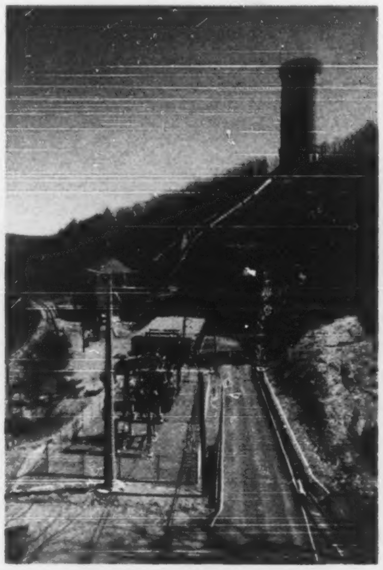
A key to its winning performance is effective cost management, which employs a variety of programs to stimulate improved productivity among employees and hold the line on expenses.

Winter peaking...by choice and effort

PP&L has worked hard to become a winter-peaking utility, which has allowed it to benefit substantially from seasonal interchange arrangements with neighboring utilities in the Pennsylvania-New Jersey-Maryland power pool. This change to a winter peak also has allowed PP&L management to postpone capacity additions.

To bring about the peak switch, the utility went into a heavy marketing mode, honing its skills to a fine edge under former Chairman Jack Busby in the 1960s and 1970s.

When Busby retired in the late '70s, the company reached outside the industry for a new leader, Robert K. Campbell. Campbell led the company through the growth years of the '80s. He died suddenly last summer. John T. Kauffman, current chairman, president and chief executive officer, continues the marketing thrust.



PP&L's Wallenpaupack plant supplies peaking hydro power and a popular vacation lake.

Electric Utility of the Year
1969-1990

1990	Pennsylvania Power & Light
1989	PacifiCorp
1988	General Public Utilities
1987	Consumers Power
1986	Minnesota Power
1985	South Carolina E&G
1984	Potomac Electric
[illegible]	Oklahoma Gas & Electric
1982	Wisconsin Electric Power
[illegible]	Atlantic Electric
[illegible]	Boston Edison
1979	New England Electric
1978	Southwestern P.S.
1977	Duke Power
1976	Tampa Electric
1975	Southern Calif. Edison
1974	Florida Power & Light
1973	Carolina Power & Light
1972	Northern States Power
1971	Virginia Electric & Power
1970	Florida Power Corp.
1969	Sierra Pacific Power

Gas tax expected in a budget deal

WASHINGTON—The only energy-related tax left in budget discussions as of Oct. 24 was on gasoline. Negotiations are expected to produce a 5-7 cent hike.

As of Oct. 24, budget reconciliation appeared stalled on how much taxes on high income should be raised. The 1991 U.S. fiscal year started Oct. 1.

It would appear, that—despite several deadline extensions, overtime negotiations, and new taxes—budget additions will detract from the deficit-reduction effort. It also seems likely that the government will need to raise the debt ceiling to $5 trillion to stay solvent.

Nuclear Regulatory Commission users' fees are expected to jump from 45 to 100 percent, costing utilities an additional $2-3 million per reactor. Environmental Protection Agency permit user fees may raise $22-42 million.

Other items, another bill

Other items under consideration were added charges for abandoned mine lands, added fees or fines for OSHA and MSHA, and changes in tax rates and fund restrictions for nuclear decommissioning.

See *EL&P*'s December issue for more information.

In a separate bill that Bush is expected to sign, QF size restrictions are lifted from geothermal, wind and solar projects. Municipal waste projects will also have restrictions lifted.

New Clean-Air law near; Oct. 22 deal

WASHINGTON—The House and Senate were expected to vote Oct. 25, possibly as late as Oct. 30, on the most expensive clean-air proposal ever. A House-Senate committee compromised on the measure Oct. 22; if signed, as expected, by President Bush, it would be the first overhaul of clean-air law in 13 years.

The full measure eventually could cost utilities $5-7 billion per year, just for the acid-rain portion. Total costs, including wide-reaching regulations on industrial and auto emissions, and phasing out chlorofluorocarbon use, could amount to $25 billion annually. Costs are expected to be passed to consumers through utility rates and higher prices in consumer products.

Sulfur-dioxide emissions would be cut 10.8-million tons per year, and nitrogen oxides by 2-million tons per year by 2000. The bill includes an estimated added $150 million in pollution credits for utilities in Illinois, Indiana and Ohio, to help with a concentration of high-emission plants, for the emission-trading plan.

Industry sources say, although some details—such as $250 million in compensation for workers who would lose jobs from the legislation—differ from the Administration's original proposal, President Bush would be hard-pressed not to sign what Congress produces, despite any minor concerns.

Details of which provisions were in or out were still sketchy as of Oct. 24, *EL&P*'s final deadline for this issue. If the measure doesn't pass or is vetoed, seen as unlikely, it would certainly be reintroduced in the 103rd Congress, after November's election.

Edison Electric Institute said the bill defers costly new regulations for visibility and utility air toxic emissions unless and until mandated studies show they are needed. A 15-month extension to meet the stringent NOx guidelines would be allowed in some cases.

House and Senate conference committee negotiators resolved the toughest issues last, such as toxics, acid rain, emissions trading and enforcement. That may have been due, in part, to the congressional energy spent on budget details (see adjacent story.)

Even without the new law, years of talk and the imminent threat of passage have prompted utilities and regulators to improve air quality, revising strategies well into the next century.

Some utilities have planned their responses to the two phases of the pending legislation for more than a year, fuel switching and some projects are underway; the table, p.3, reviews various options covered in recent issues of *EL&P*. See additional coverage in December.

*******************5-DIGIT 20814
4900127299*110190T 000000 1145

SUITE 800 COPY # 2
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

NEWS BRIEFS

B. J. DAVIDSON, Assistant Editor

Top executives change at SCEcorp

After a 36-year career at SCEcorp and Southern California Edison Company, Howard P. Allen, chairman and CEO, retired on Oct. 1. The SCEcorp Board of Directors elected John E. Bryson chairman and CEO and Michael R. Peevey president. Bryson was executive vice president and chief financial officer, and Peevey was executive vice president prior to their promotions. Both joined the company in 1984.

John Bryson

Michael Peevey

1991 National Engineers Week

Paul E. Lego, chairman and CEO of Westinghouse Electric Corp., has been named honorary chairman of this week-long event held next Feb. 17-23, sponsored by 15 professional engineering organizations. The event will focus on engineering and the environment.

Lego expressed concern about recent comparisons that show American 13-year-olds scored lowest among industrialized nations in math and science skills. "The combination of lower birth rates plus a sharp decline in the number of students pursuing mathematics and science is beginning to create a shortage of engineers at the very time demand for technical solutions to environmental and other challenges is growing."

New EEI vice chairmen

Jerry Farrington of Texas Utilities and Edward Mitchell of Potomac Electric Power Co. were elected to the positions of first and second vice chairmen, respectively of EEI. Farrington also serves as chairman of the U.S. Council for Energy Awareness and is on the boards of the American Nuclear Energy Council and the Institute of Nuclear Operations.

Increased electrification could achieve energy independence

"The Arabs can shut off our oil, but they can't turn off our electric power," said B. R. Brown, president and CEO of Consolidation Coal Co., at a Virginia Coal Council dinner. Electric power generation has been based on American energy resources—coal, hydroelectric, nuclear and gas. Brown said, "Electricity is secure. The more we can substitute electricity for our daily energy needs, the less dependent we become on imported petroleum."

Brown went on to say, "the increased share of electricity in our energy budget has been a means of energy conservation," because of more efficient electricity generation, transmission and consumption, and more efficient appliances and equipment. "When we pass laws that slow electricity demand growth, we delay the development and implementation of newer, cleaner technologies," he said. "I propose we base our energy policy on electricity, not on some particular fuel, like coal. Our nation should get behind a policy to promote energy independence through electricity."

The Earth Light wins on innovation

Because it burns 13 times longer than a standard light bulb and consumes one-fourth the electricity, The Earth Light—an invention of the Philips Lighting Company—won *Discover Magazine's* inaugural "Discover award for innovation," in the environmental category.

The lamp is a compact fluorescent bulb that emits the same amount and quality of light as a standard 75-W but uses only 18 W of electricity. It burns an average of 10,000 hr and can be expected to last approximately seven years. Over its life, the bulb is anticipated to save consumers between $50 and $100 in costs.

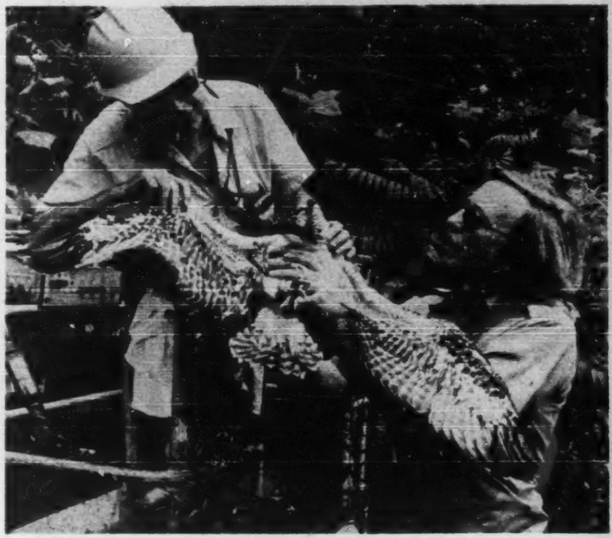
Supertrees on public service forest land

The first commercially available white spruce "supertrees" were planted on hydroelectric flowage lands owned by Wisconsin Public Service, Green Bay. Supertrees will be ready for harvesting after about 50 years, whereas a wild spruce takes about 100 years. In addition to wood production, the trees may find a market for planters concerned about the growing accumulation of carbon dioxide in the atmosphere.

Public Service manages its lands for a balance of pulpwood, public recreation, wildlife habitat and hydropower production. Linus Stoll Public Service's CEO said, "The supertree symbolizes the creativity that we must pursue in finding ways to protect both the environment and the economy." He said the hydro lands are a fitting place for these trees, since they are managed under an "integrated planning process," sensitive to both the need to protect endangered species and the direct needs of society.

Neil Nelson, president of Forgene Inc., the tree's developer, said the new tree, named "elite white spruce hybrid," is the first conifer supertree to be made commercially available. Previous supertrees have been developed from the broadleaf poplar.

EPA Environmental Learning Award Recipient


Kim I. Mengel of Metropolitan Edison assists Larry M. Rymon of East Stroudsburg University in identifying a young osprey by attaching a leg band.

Metropolitan Edison Co. has received the 1990 Center For Environmental Learning Award from the U.S. EPA, Region III, for its support of an East Stroudsburg University program to reintroduce ospreys in its service territory. The ongoing 8-year program was recognized for creating new nesting sites, leading to a substantial increase in the number of ospreys making the MetEd area home after nearly 40 years' absence. The company was a major contributor to the production of a film about the project for use by conservation groups and schools in its territory.

Since 1982, MetEd has provided space for nesting facilities at its Portland Generating Station for osprey chicks taken from the Chesapeake Bay.

Arizona Public Service employees receive award at White House

The Arizona Public Service Co. Employee Volunteer Program recently received a national environmental award—a "Take Pride In America" plaque—from Interior Secretary. Manuel Lujan, Jr. during special ceremonies at the White House. The award was given to more than 500 employees, their families and friends, who cleaned, repaired and repainted the Pioneer Arizona Living History Museum, located north of Phoenix. The April 1989 undertaking was the largest single corporate volunteer effort in Arizona.

It is the second time the APS volunteers have won a White House award. Last year the group completed a massive roadside cleanup near the company's Palo Verde nuclear power plant that resulted in the collection of 16,000 pounds of trash and 1,500 pounds of recyclable aluminum cans from 14 miles of roadway near Palo Verde.

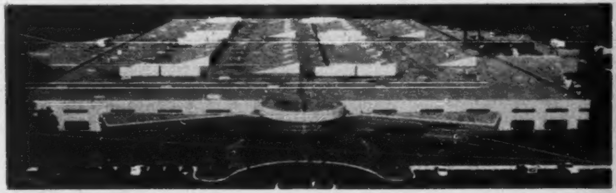
Steel transmission pole pioneer dies

Roy Meyer, retired, tough, nonsense former owner of Meyer Industries and developer of steel transmission poles for electric utility applications, died Sept. 29 in Red Wing, MN. Meyer, 78, was known throughout the industry for his innovation, dedication to customer service and absolute fairness. Meyer Industries now is operated as a subsidiary of FL Industries.

Correction

The Oregon Public Utility Commission staff recommended guidelines for competitive bidding, not Ohio as reported in "News Briefs" in the October issue, page 2. Ohio's regulatory staff is investigating bidding but isn't close to making a recommendation.

Pressure transmitter facility


This pressure transmitter manufacturing facility was dedicated recently by Rosemount Inc. near Minneapolis, MN. The 340,000-sq ft facility uses a "cellular" approach to manufacturing, rather than the production-line process. The cellular approach assigns teams of employees to the complete manufacture of given products rather than large numbers of employees, each doing just one task

IN THIS ISSUE

INDUSTRY NEWS

Clean Air legislation ignores reliability: NERC. 3
Soviets cut into U.S. uranium enrichment; Congressional action urged. 12
Special report: Pennsylvania Power & Light Co. wins Utility of the Year. 19

T&D TECHNOLOGY

Color-coded maps aid line crews. 27
Breakaway pole reduces damage and injuries. 27
Selecting batteries: An application primer. 30
Automatic Meter reading takes giant step forward. 34

GENERATION TECHNOLOGY

Leaking canopy seal welds can be fixed more easily with this device. 36
Millstone went to electronic publishing to improve its operations. 36

REGULAR FEATURES

Commentary and **Letters** 4
Rate Activity 16
Financial Performance 17
Labor/Management Concerns 26
Information/Control Systems 35
New Products, New Literature 48,56
Readers' Service 51
Calendar 54
Management Methods 59
Regulatory Review 60

Clean Air legislation threatens reliability, NERC says

PRINCETON, NJ—The impending Clean Air Act amendment is "the most significant threat to reliability" among environmental concerns, said the North American Electric Reliability Council (NERC).

In addition, NERC's *1990 Reliability Assessment* slammed Congress, the administration, regulators and other policymakers for transmission restrictions due to EMF concerns, disincentives for utility investment in large capital projects and added utility hydroelectric constraints.

These and others restrictions have limited facility use or have contributed to a lack of construction that severely risks system reliability, NERC said. Construction hasn't begun on 55 percent of the new generating capacity previously announced for the next 10 years in the U.S., up from 41 percent in 1989 and 30 percent in 1988.

Regarding the Clean Air Act, NERC said, "This legislative effort appears to be advancing with little regard for the profound effects it will have on the adequacy of installed generating capacity, the ability and/or inclination of utilities to render emergency assistance to neighboring systems, and the viability of capacity transactions as a resource option."

NERC stressed vehemently that the Clean Air Act revisions would:

- Delay approval or commissioning of new facilities.
- Place constraints on current facilities that will limit output.
- Reduce capacity margins.
- Increase the risk of customer service interruptions.
- Provide little or no significant environmental or health benefits.

"The resultant impacts on system reliability and costs may have negative effects on electricity use, economic growth, lifestyles, and the standard of living," the report said.

System Options (Nontechnology) • Buying/selling allowances • Unit retirement/replacement • Emission dispatch • Bulk power purchases/sales • Demand-side management	• Conservation • IPP • Trade pollutants ($NO_x \rightleftarrows SO_2$) • Mergers and acquisitions • Over- or undercompliance	**Repowering/ Performance Improvement** • Atmospheric fluidized bed combustion • Pressurized fluidized bed combustion • Integrated gasification combined cycle
Fuel Options • Switch fuels - Low-sulfur coal - Natural gas - Co-firing	**SO_2 Control Technology** • Conventional wet FGD • Regenerative wet FGD • Spray dry FGD • Furnace dry sorbent injection • Postfurnace dry sorbent injection	
NO_x Control Technology • Low NO_x burners • Overfire air • Reburning (coal/gas)	• Selective noncatalytic reduction • Selective catalytic reduction	• Conventional wet FGD • Switch fuel - Low-sulfur coal - Natural gas

Source: Temple, Barker & Sloane Inc.

The legislation would create profound regional disparities. With acid gas emissions, for example, "The Eastern Interconnection would bear most of the brunt as about 92 percent of the effects are postulated to be in that area."

NERC also reiterates the Department of Energy's concern that funds for, and investment in, the Clean Coal Technology Program would be diverted because of the need to upgrade existing utility facilities.

NERC expects premature retirement of some plants that would require modifications not considered routine.

Operating complexities due to the necessity of emissions dispatching may stress certain transmission lines and interfaces now close to transfer limits "with increased risks to system security in the event of severe disturbances."

Other issues cut reliability

The report also covers reliability issues relating to:

- *Electric and magnetic fields:* Despite weak evidence of low correlation between EMF and adverse health, planned transmission lines have been delayed or cancelled; others have been removed.
- *Carbon dioxide emissions:* No scientific consensus exists regarding links between carbon dioxide emissions from burning fossil fuels, recent droughts and the alleged warming of the earth's atmosphere. NERC calls for more study before policies are made—no power supply now, or in the foreseeable future, can adequately replace fossil generation.
- *Hydroelectric capacity*: New river regulation requirements for recreation and water oxygen levels could severely restrict certain facilities. Northern Arizona's 1300-MW Glen Canyon hydro complex stands to lose 200-600 MW of peaking capacity, NERC cited.
- *Fuel supply adequacy:* Indicators suggest uncertainties regarding future availability and deliverability of natural gas and low-sulfur residual fuel oil. Inability to obtain firm, long-term natural gas contracts from suppliers raises additional concerns.
- *Regulatory disincentives*: Rate-base disallowances, "along with regulatory delays, inconsistent public policies, and overlapping jurisdictions have resulted in many utilities being reluctant and sometimes unable to commit to major long-term generation or transmission projects."

More next month

The 80-page report, released Sept. 27, covers the future of bulk system reliability in North America from 1990-99. NERC, formed in 1968, coordinates efforts in, communicates information about, and promotes reliability of generation and transmission systems.

December's *EL&P* will provide a regional assessment of reliability and graphics showing demand trends.

Ontario Hydro hit by fine after workers' exposure

TORONTO—Ontario Hydro was fined C$18,000 by Ontario Provincial Court after admitting responsibility for the most severe radiation exposure accident ever at a Canadian utility.

The utility pleaded guilty in August to four charges filed by the Atomic Energy Control Board (AECB) after the accident a year earlier at the Pickering Nuclear Generating Station east of Toronto. A fifth charge was dropped through plea bargaining.

Both government and defense lawyers recommended a $4,500 fine on each count. (The maximum fine allowable is $5,000 per count.)

The utility pleaded guilty to one count of failing to take "all reasonable precautions" in training for and execution of the task performed by the men and three counts of allowing overexposure to radiation, one for each of the three workers.

The fifth charge was for failure to assess the radiation dose the workers would incur and to gain proper approval for work done in a radiation field exceeding 3 rem/hr. Hydro's Radiation Protection Regulations, referenced in the Pickering Operating License issued by AECB, requires the station's senior health physicist to approve the full work plan for all tasks in radiation fields expected to exceed 3 rem/hr. Approval apparently was not sought in this case.

The accident occurred when the three mechanics were removing an adjuster rod from the core of Reactor Unit 1. The crew used a connector tool (a "shielding donut") they believed would protect them from the gamma radiation emitted by the cobalt rod. However, the connector was only a training ring, which closely resembled a real shield but was built for instructional use only.

The safety report on the accident recommended improvements in Hydro's system of managerial procedures and coordination, and in equipment design. The report concluded that the accident would not have occurred if the adjuster rod had been removed remotely, and if rehearsal tooling was properly identified. "The risks associated with performing this job manually were underestimated," the report states.

In the August 1989 accident, the mechanic who was surveying radiation fields near the adapter ring received a whole-body dose of 12.7 rem. This exposure more than doubled the AECB occupational limit of 5 rem/yr and was the highest ever recorded at a Canadian power reactor.

The second man received the next-highest recorded dose, 9.2 rem, while the third worker absorbed 2.2 rem.

Hydro's whole-body dose target limit for Pickering was 2 rem/yr until 1990, when it was reduced to 1.8 rem/yr.

The highest extremity doses (to a foot or hand) to each of the men were 73.4, 10.3 and 73.8 rem, respectively. AECB's annual limit for maximum extremity dose is 75 rem.

The data was developed by Hydro from the dosimeters worn by the three workers, and from accident reconstruction techniques.

Picking up the pieces

Pickering Production Manager Bob Schuelke said safety changes since the accident include painting rehearsal equipment a different color from nuclear equipment and motorizing the rod-removal process, which allows adjuster rods to be withdrawn from the reactor by remote control.

He stressed, "Our management system was seriously wrong to allow this accident to happen. We have improved our whole procedure for storing and cataloging equipment, and have reformed our job orientation to give workers greater input into the design and planning of plant tasks."

A first

The ACEB's prosecution of Ontario Hydro was the first ever initiated against a nuclear utility, said Board President Rene Lévesque. He added that the deterrent value of the ACEB's prosecutions would be enhanced by large increases in the now-small fines set by its enabling legislation, the Atomic Energy Act of 1946. The only way to raise these penalties, however, is by government cabinet intervention leading to a change in the legislation.

Without suitable financial penalties, the only other course open to AECB is to revoke or amend existing licenses, or to withhold new ones—but the process is cumbersome. Lévesque said AECB needs a sanctions package better tailored to deterring day-to-day violations in the nuclear industry.

CECo settles fire outage damages, extends Chicago franchise by 1 year

CHICAGO—Commonwealth Edison Co. will pay an estimated $4 million in damages to customers of West Side outages caused by substation fires July 28 and Aug. 5 named in a class action suit, under a preliminary Cook County Chancery Court decision. Payments range from $20-190, under the plan.

The suit was brought, in part, because the fires affected many of the same customers, for as long as three days. (*EL&P*, Sept.'90,p.1).

The company said the decision was fair and was not precedent-setting because of the rare circumstances involved. Negligence did not cause the fires, CECo maintained.

In other news, Chicago's city council is scheduled to vote on CECo's one-year franchise extension Oct. 31, previously agreed to by Mayor Richard M. Daley and the company. The mayor questioned the company's reliability, saying he wants to wait to see the outcome of several investigations relating to the fires before a long-term extension.

If approved, CECo's continues payment of its municipal franchise fee, 4 percent of the company's gross revenues in the city—in 1990, an estimated $66 million. The franchise is due to expire Dec. 31.

Sale completed

DULUTH, MN—Minnesota Power Co. completed the sale of 20 percent of its 500-MW coal-fired Clay Boswell Station Unit 4 to The Wisconsin Public Power Inc. System (WPPI) of Sun Prairie, WI, for $84 million.

The sale adds 38 cents per share to '90 MP earnings. WPPI made wheeling arrangements.

Correction

CHICAGO—Long Island Lighting Co.'s 1500-MW Northport plant was incorrectly called the largest U.S. oil-fired station (*EL&P*, Oct.,p.1). Commonwealth Edison Co.'s five-unit Collins plant in Morris, IL, totals 2698 MW.

COMMENTARY

Who's next? Keep us informed

In this issue, *EL&P* congratulates Pennsylvania Power & Light Co. for winning the 22nd Electric Utility of the Year Award (p.19).

Another investor-owned utility asked recently, "How do we get nominated for Utility of the Year?" The answer is, "Deliver what every utility strives for: outstanding results for customers, shareholders, employees, communities, and innovation in the industry. And inform us of your progress."

EL&P's year-round information-gathering process provides editors with a fine decision-making base—we use information from *EL&P*'s January Annual Capital Investment Forecast, May's Annual Report Review, June's Top 100 Electric Utility Financial Performance, and August's Top 100 Electric Utility Operating Performance, monthly columns, as well as information from focus reports, and other financial and technology coverage. Editors meet in July to discuss prospects. During a series of August meetings, editors nominate, research, and investigate candidates, then choose the winner, after analyzing all aspects of what it really means to "provide safe and reliable electric service."

Remember reliability?

An adequate supply of reliable electricity has become so taken for granted, it may become an endangered species. The North American Electric Reliability Council's *1990 Reliability Assessment* blames policymakers for short-sighted thinking that continues to restrict adequate utility investment in supply and delivery capacity (p.3).

NERC points out that the gap in planning and construction widened over the past year. Building hasn't begun on 55 percent of the new generating capacity previously announced for the next 10 years in the U.S., an increase from 41 percent in 1989 and 30 percent in 1988. Is a crisis the only way to manage an equitable solution? Let's hope not.

In related commentary, opponents of the Trojan nuclear plant say there's no reliability problem if a voter referendum closes the plant—utilities can use Bonneville Power Administration capacity. Do you suppose those same people also oppose flooding additional land in Washington or British Columbia for increased hydro capacity? And one comment from abroad... A German official announced plans to close 1730 MW of operating East German reactors, with the possibility of cancelling six other units under construction, because they're all of Soviet design. Is safety the only issue, or has public pressure defeated any engineering efforts toward a more cost-effective solution?

Thanks, NERC, for doing your part to protect what seems to be an increasingly endangered species, electric reliability.

And thank you, Congress

Utilities challenge themselves and each other to do more with less. Congress is doing less with more. Despite all discussions of budget cutting, representatives didn't touch their scheduled salary hike. House wages will increase from $96,600 to $125,100 on Jan. 1. Senators' wages will increase as well.

Even President Bush, considered a Washington insider, couldn't resist jabbing the Capitol Hill debacle at an October campaign stop. He said, "It's Congress' responsibility to pass a budget, and year after year they fail to do so."

Congressional incumbents continue to wax eloquently about what a wonderful job they've done. Voters need to connect those people to the institution. Congress misses budget deadlines, bickers endlessly, and fails to make meaningful deficit reductions. It collects more taxes, finds more ways to spend what it doesn't have, and raises the debt ceiling. It waits until the last minute to hammer out myriad complexities of the Clean Air bill, but squeezes in legislation to help out constituencies and special interests days before the election.

Given the condition of congressional "efficiency," *EL&P* readers shouldn't miss the Nov. 6 ballot-box deadline. Thank Congress for all it's done for you. (...or to you.)

—Mark T. Hoske, News Editor

EL&P
ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher
Robert A. Lincicome
Editor-in-Chief

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
B. J. Davidson, Assistant Editor
Dianne Wilson, Editorial Assistant-Products/Literature
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President, John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $4 + postage ($7 + postage foreign). Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44631. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

Lighting fixture warranties

I have read with concern recent promotions for warranties on lighting fixtures that could be misleading your readers. At first glance, it seems that the manufacturer is warranting the entire fixture for 5 years, when, in fact, the 5-year warranty applies only to the ballast—or the fixture's electrical system.

Most of the time, lighting manufacturers offer a 1-year warranty on their fixtures, which covers both materials and workmanship. If a unit is defective, the manufacturer will correct the defect, at no cost, by repairing the unit or providing replacement parts. This guarantee is good for 1 year beyond the date of manufacture.

In Holophane's case, all fixtures are warranted for 2 years and the HID electrical components for 5 years.

We feel that a promotion that implies that the entire fixture is warranted for 5 years is misleading and costly. If something goes wrong with a unit after 1 year that does not involve the electrical system, the customer is on his own. He must bear the expense and the inconvenience of getting that fixture fixed or replaced.

As always, it pays to read the fine print in a warranty. It can save a lot of time, grief and money.

John Forbes
Vice President, Marketing
Holophane Company Inc.
Newark, OH

Photovoltaic efficiencies

"Commentary" (May 1990, p. 4) on "Photovoltaic efficiencies improved; the gap is narrowing" must have additional engineering clarification, in order to avoid being a grossly misleading criterion for solar cell development "before becoming a potential substitute...for conventional generation." Solar insolation, fuel-conversion efficiency and heat-rate conversion efficiencies in fossil- or mineral-fueled plants simply do not have similar impacts on the design and economics of large-scale electric generation. It is plain wrong to infer some efficiency criterion for realization of solar voltaic generation (SVG) in the nation's electric power mix based on approaching the fuel conversion efficiencies of conventional generation.

The long-standing heat-rate contest, that *EL&P* regularly reports, is critical in conventional boiler fuels as the cost of oil, coal, gas and yellow cake escalate and are pushed through regulators to consumers. The fuel for a utility SVG plant is free, delivered at any plant site for as long as we need it; century-life plants with periodic upgrade of the cell panels, generator modules for increased plant capacities and revenue return as cell manufacturers improve their product.

Just as plant capital investment is impacted by a better heat rate for a given amount of plant site land, manufacturing, site construction and O&M, so also does fuel conversion efficiency in solar voltaic cell modules impact the SVG land area, array materials, erection maintenance, power extraction to the transmission and the energy management subsystems. SVG cell modules at, say, 14-percent fuel conversion efficiency mounted along access track rows, have a plant density of about 150 MW (installed nameplate capacity) per section of land. And with cogeneration, kilowatts plus crops at about 85 percent of normal on tilled land, allows efficient agri-automation along the rows of access track, automated agriculture powered by the array. Realizing the 26-percent efficiencies cited in [the] *EL&P* "Commentary" extrapolates to about 278 MW capacity on each square mile of plant array, an obvious benefit in reducing plant investment cost.

Consider today's 150 MW per section density, at an annual capacity factor of 0.25 to 0.30 since [SVG] fuel supply is reduced by clouds and to zero at night, then concentrated in a single plant in the Southwest's high solar-[insolation region]. Here an SVG array area of only 93 miles by 93 miles would supply 2,854,168 GWh, equal to the 1989 output of the nation's electric utility industry (*Power Engineering*, April 1990)—or GWh equal to the '89 utilities' output from a square patch only 68 miles on a side with the reported 26 percent solar fuel conversion plants.

EL&P "Commentary" on the "narrowing cost-competitive gap" begs the question of what an SVG cell module would cost. At about 14-percent fuel conversion efficiency, a square-meter generator module is rated 0.014 kW. Drawing a mass production example from a comparable electric device, the ubiquitous 4-ft fluorescent tube, often at 99¢ retail, half coated with photovoltaic material, requires 21.5 PV tubes for that 0.14-kW SVG; anticipating a $150/kW SVG plant generator subsystem—$82/kW for the improved 26 percent photovoltaic materials in the PV tube. Then add subsystems for station and transmission structures, energy extraction, and energy management (perhaps another $500/kW) with the SVG increments going online as delivered to the site avoiding interest during construction. [In other words,] balance of system can outlast a series of generator subsystem retrofits by many decades. Echoing "Commentary, the gap is narrowing...and one day, perhaps within five years, who knows...?"

Alfred H. Canada
Consultant
Grants Pass, OR

P.S. I was tempted to add "John Sununu knows!"

Filer City contractor

In the August 1990 issue of *Electric Light & Power*, page 47, a picture and brief description of the Filer City Cogeneration Facility appeared. The part about the general contractor was in error. The EPC contractor is a joint venture between Southern Electric International (SEI) and Fluor Daniel with SEI responsible for project management.

We would appreciate very much a correction being printed in the earliest possible issue. Thanks for your attention.

Randy W. Kirkus
Senior Project Manager
Southern Electric International
Atlanta, GA

Editor's Note: EL&P thanks reader Kirkus for correcting our August story and apologizes to both SEI and Fluor Daniel for the error.

Alcan to open new West Coast plant

ATLANTA—Alcan Cable announced plans to build a $20-million plant in Roseburg, OR. J. R. Frangipane, president, said,"Our westernmost plant is now in Sedalia, MO, so this new plant will enable us to better serve West Coast customers. James Mann, a veteran of 23 years with Alcan Cable will be Project/Plant Manager.

Dept. of Energy greenlights two Clean Coal projects

WASHINGTON—Two new Clean Coal projects became the 25th and 26th to be negotiated by the Dept. of Energy.

Bechtel Corp. will demonstrate a low-cost method for reducing sulfur-dioxide pollutants, and EER Inc. will investigate techniques for lowering nitrogen oxides.

CZD in Pennsylvania

Bechtel will demonstrate confined-zone dispersion (CZD) at Pennsylvania Power & Light Co.'s Seward Station. CZD avoids the expense and space needed for a scrubber by capturing pollutants inside a plant's ductwork. Although not as effective as a scrubber, CZD may allow many existing power stations to remain operating longer.

Atomizers inject a fine spray of water and sulfur-absorbing lime into the ductwork between a boiler's air heater and particulate-removal equipment. The positioning of the atomizers creates a cone-shaped confined zone of wet particles surrounded by an envelope of hot combustion gases.

As the "cone" moves through the duct, the gas inside cools and SO_2 is absorbed by the droplets. The droplets mix with the hot gases outside the cone and dry quickly. They then can be removed by existing particulate collection equipment.

Gas reburning

EER will expand its work on gas reburning at Public Service of Colorado's Cherokee Power Station.

Natural gas will be added to coal combustion products above the main coal-combustion zone. In this fuel-rich reburn zone, hydrocarbon fragments from the gas react with nitric oxide to form nitrogen. Air to complete combustion is added above the reburn zone at temperatures low enough to prevent additional NOx formation.

Air filter sales, regulations to grow

NEW YORK CITY—Stricter air quality guidelines from the federal government will breathe new life into the air filtration market.

To grow or not to grow

Near-term, according to a 241-page report from Frost & Sullivan Inc., the "determinant of market volume will be U.S. industry's need to have engineering controls in place by 1993 to achieve compliance with OSHA's tighter in-plant air-quality standards, the so-called 'Pell Standards,' issued in 1989." It also cautions, however, that "the fragility of the domestic industrial economy will act as a drag on potential filtration growth."

The air filters market is examined from the viewpoint of 10 principal end-user industries (see chart) and eight major product categories, forecasting growth to 1994. Electric utilities generated $90 million, or 13 percent of sales demand, in 1989.

The competitive environment is looked at through profiling major suppliers. The seven largest of these vendors control almost 60 percent of all sales in the country.

Types and growth

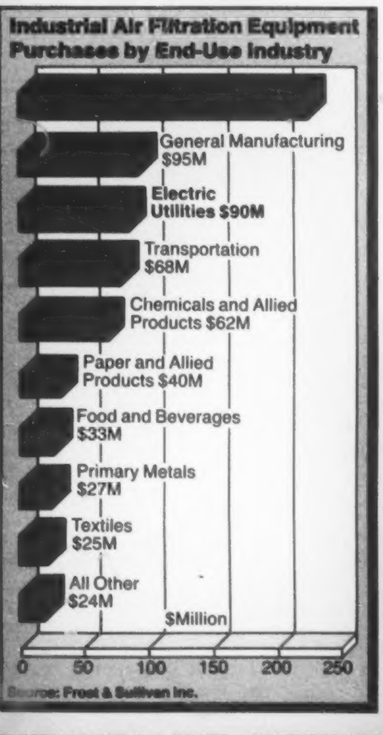
ASRAE-rated filters accounted for 36 percent of the market, or $245 million, in 1989. Demand for them is predicted at $288 million in '94.

High-efficiency air-particulate (HEPA) filters comprised 26 percent of the 1989 market, or $181 million. This category of filters is predicted to grow fastest due to higher sales of disk drives and the need for better clean-room technologies as semiconductor manufacturers move deeper into submicronic geometries. HEPAs are expected to be a $228 million sector by 1994.

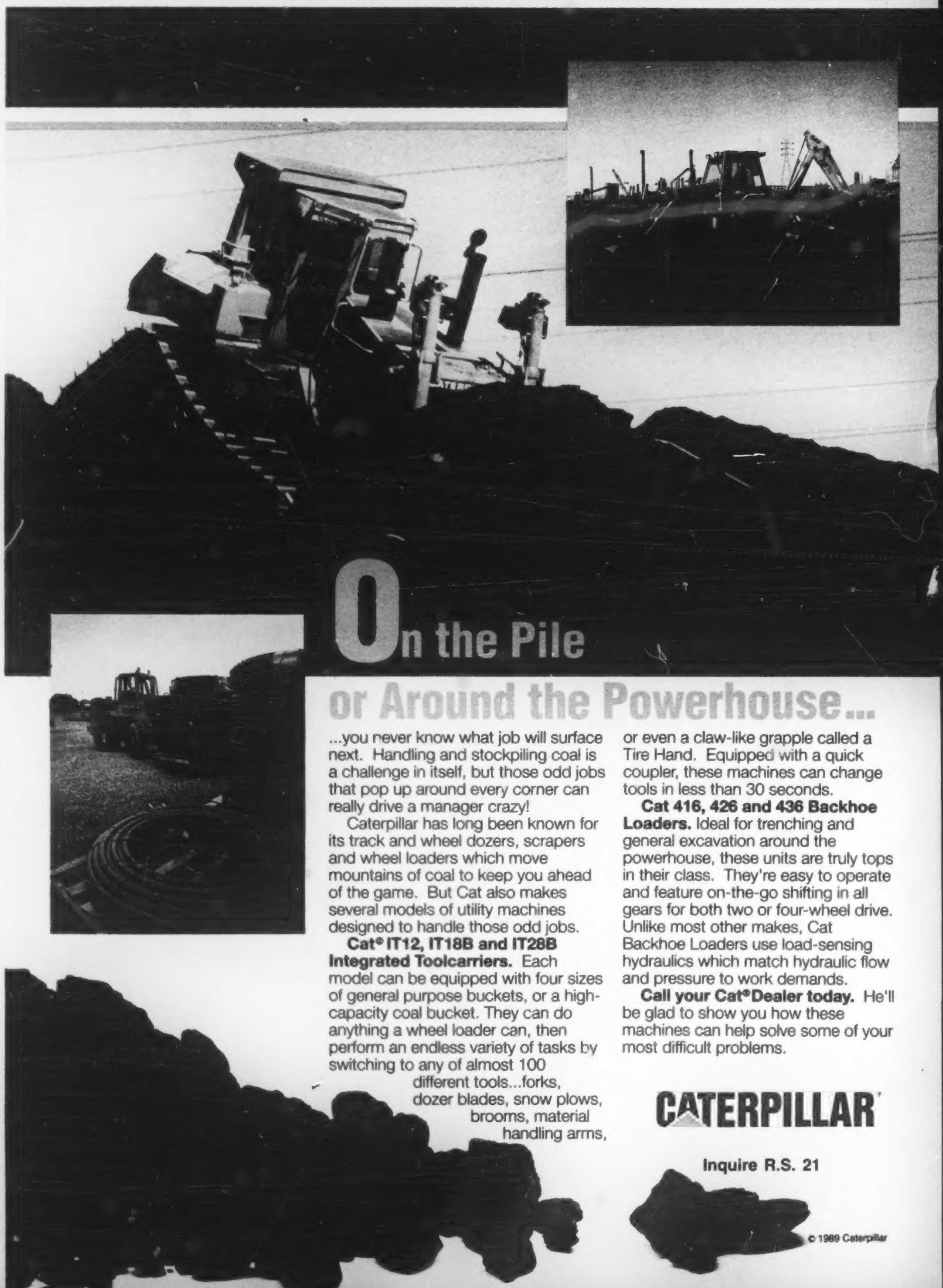
Dust collectors, electronic air cleaners and carbon filters sold at $65 million, $50 million and $41 million, respectively, in '89. By '94, dust collectors will rack up $78-million worth of sales; electronic air cleaners, $61 million; and carbon filters, $50 million.

"The U.S. Market for Industrial Air Filtration (IAF) Equipment," Report #A2348, costs $3,000 and is available by contacting: Customer Service, Frost & Sullivan Inc., 106 Fulton St., New York, NY 10038; phone 212/233-1080.

Industrial Air Filtration Equipment Purchases by End-Use Industry



Source: Frost & Sullivan Inc.


On the Pile or Around the Powerhouse...

...you never know what job will surface next. Handling and stockpiling coal is a challenge in itself, but those odd jobs that pop up around every corner can really drive a manager crazy!

Caterpillar has long been known for its track and wheel dozers, scrapers and wheel loaders which move mountains of coal to keep you ahead of the game. But Cat also makes several models of utility machines designed to handle those odd jobs.

Cat® IT12, IT18B and IT28B Integrated Toolcarriers. Each model can be equipped with four sizes of general purpose buckets, or a high-capacity coal bucket. They can do anything a wheel loader can, then perform an endless variety of tasks by switching to any of almost 100 different tools...forks, dozer blades, snow plows, brooms, material handling arms, or even a claw-like grapple called a Tire Hand. Equipped with a quick coupler, these machines can change tools in less than 30 seconds.

Cat 416, 426 and 436 Backhoe Loaders. Ideal for trenching and general excavation around the powerhouse, these units are truly tops in their class. They're easy to operate and feature on-the-go shifting in all gears for both two or four-wheel drive. Unlike most other makes, Cat Backhoe Loaders use load-sensing hydraulics which match hydraulic flow and pressure to work demands.

Call your Cat® Dealer today. He'll be glad to show you how these machines can help solve some of your most difficult problems.

CATERPILLAR

Inquire R.S. 21

© 1989 Caterpillar

C6985-6

DECEMBER 1990

ELECTRIC LIGHT & POWER

EL&P

Volume 68, Number 12
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

KG&E to merge with KP&L

Leaves hostile Kansas City P&L without a target

TOPEKA, KS—Kansas Gas & Electric Co. and The Kansas Power & Light Co. have signed an agreement to merge, effectively putting an end to Kansas City Power & Light Co.'s hostile tender offer for KG&E (*EL&P*, Sept., Nov., p.1).

KCP&L launched its unsolicited tender offer for KG&E July 23, for $873 million. KG&E fought the attempt, saying it was illegal and underpriced. KCP&L said it would leave its tender offer open.

With appropriate regulatory and shareholder approvals, KG&E would become a subsidiary of KP&L. KP&L's offer was $32/share cash and/or KP&L common stock, not to exceed $434 million in cash. In addition, the maximum number of shares issued will be approximately 28 million, based on a conversion ratio for KP&L stock at $20-$23.75 at the time of the transaction. The total offer would be about $1 billion.

"After carefully reviewing all options," said KG&E's Wilson K. Cadman, KG&E "has concluded that this merger serves the best interest of the company's shareholders, its customers and employees."

Cadman, KG&E's chairman and CEO, said the "friendly combination" preserves KG&E jobs, and creates "strategic electric transmission capability to move bulk power from Nebraska to Oklahoma, from Missouri to western Kansas and all points in between."

KG&E rates would fall by $15 million after the merger, KP&L said.

Strong strategic fit

John E. Hayes Jr., KP&L chairman, president and CEO, said the merger would be a "strong strategic fit. We believe this transaction is consistent with our intention to continue our record of dividend payments."

Hayes added, "We do not anticipate any layoffs for either company as a result of this merger."

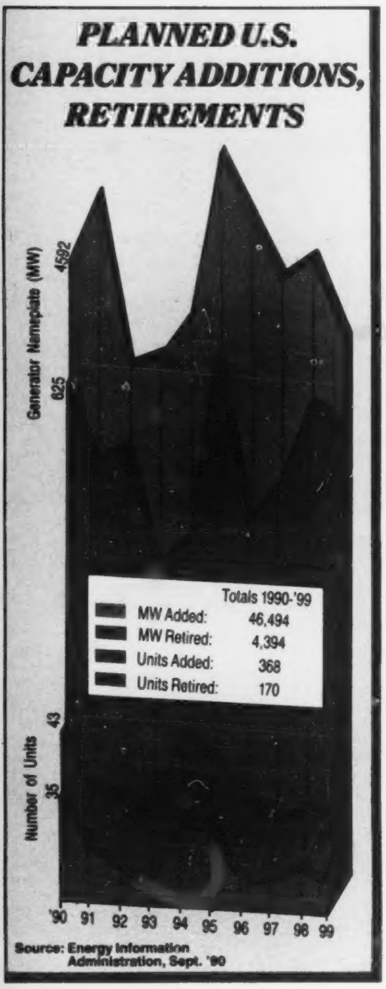
Hayes stated that hostile suitor "Kansas City Power & Light has stated that a major reason behind its unsolicited offer to acquire Kansas Gas & Electric was to take over Kansas Gas & Electric's available electric capacity. When our friendly merger is approved, we pledge to make available to Kansas City Power & Light the electric capacity that they say is necessary to fulfill their customer needs into the late 1990s."

Cadman concluded, "We're bringing together one of the world's best nuclear operations and one of the most environmentally clean coal-fired generating complexes in the nation. This energy resource mix and distribution network will provide the flexibility to bring our customers the most efficient combination of domestic energy at competitive prices."

Business comparison

KP&L, headquartered in Topeka, KS, conducts business in its service area as KPL Gas Service, with 1.06 million gas customers and 302,000 electric power customers. Gross 1989 revenues were $1.1 billion; net income, $73 million; employees, 4600.

KG&E, based in Wichita, KS, serves more than 250,000 electric customers. It had 1989 gross revenues of $533.4 million, and net income of $47.5 million, with 1330 employees.



PLANNED U.S. CAPACITY ADDITIONS, RETIREMENTS

Source: Energy Information Administration, Sept. '90

Court kills NRC's one-step license

WASHINGTON—The Nuclear Regulatory Commission overstepped public rights with the "one-step" nuclear power plant licensing, ruled a federal appeals court on Nov. 2.

The U.S. Court of Appeals for the District of Columbia supported portions of the streamlining, such as standardized nuclear design and advanced siting approvals. But the unanimous decision said the provision that would allow power plant operators to receive construction *and* operating permits in a single procedure violates the Atomic Energy Act.

Could hamper new construction

The streamlining, approved by the NRC in April 1989 (*EL&P*, May, p.1), was called by then-NRC-Chairman Lando W. Zech "the most important change in our licensing process in more than 30 years." Utilities praised the decision because it alleviated the risk of protracted delays in licensing hearings, which has added billions of dollars and years of time to the cost and construction of several plants.

NRC spokesperson Bob Newlin said the NRC is examining the ruling before deciding on its next step.

LATE NEWS

Strategic plan may untangle obstacles to new nuclear plants—goal: operation by 2000, p.4,7.

The U.S. resists international pressure to set CO_2 emission limits or a timetable for cuts at the Second World Climate Conference in Geneva in November, citing programs to slow hikes in emissions that may affect climate. Pressure is expected to grow.

Next month: *EL&P*'s Annual Capital Investment Forecast.

INSIDE: '91 Calendar of Events.

CLEAN AIR

A new Clean Air law: Compliance, p.3; Environmental Protection Agency works on interpretation, p.7. President Bush signed the bill into law Nov. 15.

New law mandates include:

- SO_2 cuts, cap of 10.6-million tons per year by 2000, with half of the cuts by Jan. 1, 1995; allowances based on '85-87 baseline; early reduction credits, extensions; various bonuses. Annual SO_2 emissions credit auction starts in '93. Credits may be bought and sold.
- **NOx cuts** will be specified in 1993 and 1997.
- **Air toxic cuts** of 90 percent by 2001 for 189 substances; best achievable technology must be installed between 1995 and 2003.
- **Monetary**, criminal penalties.

Utilities merge in Iowa and Colorado

Iowa Resources Inc. and Midwest Energy Co. merged the two holding companies into a new holding company—Midwest Resources Inc. headquartered in Des Moines, IA.

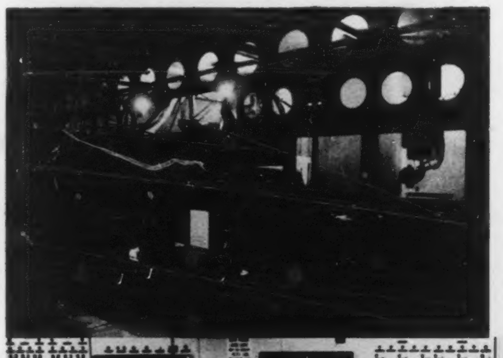
In separate merger news, Tri-State Generation and Transmission Association filed its plan of reorganization for Colorado-Ute Electric Association with the U.S. Bankruptcy Court in Denver in November.

The Iowa merger, which became effective on Nov. 7, has been approved by the necessary regulatory agencies.

As a result of the merger, Midwest Resources now will own two utility operating companies, Iowa Power Inc. and Iowa Public Service Co. It will also own

Continued on page 8

Automation controls coal units



By late 1991, Metropolitan Edison Co. expects to have automated control on all coal-fired units. Two units at Portland Station are nearing completion (top). The system is already in operation at one of the three units at the Titus Station (bottom). Cost at both stations is estimated at $18.9 million.

After completion, Met-Ed will load dispatchable units from the central energy control system. The computerized control automatically adjusts coal, air, water and all associated operations.

**************5-DIGIT 20814
41001273O2*1201901 000000 1535
SUITE 800 COPY # 1
CONGRESSIONAL INFO SERVICE002
4520 EAST WEST HWY
BETHESDA
MD 20814

NEWS BRIEFS

JILL MINNER, Special Projects Editor

CILCO agrees to buy power from CIPS

CILCORP Inc. announced that one of its subsidiaries, Central Illinois Light Co. (CILCO), has signed an agreement to purchase electric generating capacity and associated energy from Central Illinois Public Service Co. (CIPS). According to CILCORP, the contract runs from Jan. 1, 1991 through May 1998. Under the agreement, CILCO will buy 30 MW from CIPS in 1991, and will gradually increase its purchases to 90 MW in 1997. CILCO also has the option of increasing its purchases to 100 MW at any time. The agreement, which is part of CILCO's Least-Cost Electric Energy Plan, is pending approval from the Illinois Commerce Commission.

Pay increases for utility CEOs big in '89: study

Chief executive officers at electric and gas utilities received an average 17-percent increase in their 1989 cash compensation, according to a report by the Utilities Consulting Group. The study, *Executive Compensation Among Utilities: 1990*, also found that 28 electric and gas utilities have instituted annual incentive compensation programs since 1987. The 300-page report reviews the compensation practices of 231 investor-owned utility companies, including electric, gas, telephone and water.

UtiliCorp wins $15 M in anti-trust lawsuit

UtiliCorp United said it will receive $15 million over two years as a result of an anti-trust lawsuit settlement involving three of its natural gas suppliers. The suppliers were responsible for overcharges from 1979 to 1982 that were passed on to some of UtiliCorp's customers served by Missouri Public Service and Kansas Public Service, according to the company. "We will achieve a very substantial recovery for our Missouri and Kansas customers," stated UtiliCorp Chairman and President Richard C. Green, Jr. "In addition, we will recoup our legal expenses and anticipate that our divisions also will be able to recover some portion of the earnings they lost. We are extremely pleased with this settlment." The suppliers involved in the settlement include Amoco Production Co., Oxy USA Inc. and Williams Natural Gas Co.

SCE&G picks president

Bruce D. Kenyon has been appointed president and chief operating officer at South Carolina Electric & Gas Co. He was previously senior vice president for division operations at Pennsylvania Power & Light Co. "Mr. Kenyon is an organized and proven leader with 20 years of utility experience. He is well versed in virtually every aspect of utility operations from nuclear production of energy to company-wide marketing and customer services. He will be an asset to our company..." said SCANA Chairman and CEO Lawrence M. Gressette. Kenyon succeeds the retiring Thomas C. Nichols Jr.

Detroit Edison VP elected ECAR chairman

Willard R. Holland, Detroit Edison senior vice president-energy marketing and distribution, will serve as chairman of the executive committee of the East Central Area Reliability Coordination Agreement. He will also represent ECAR on the board of trustees of the group's parent organization, the North American Electric Reliability Council (NERC). "The United States has the largest and most dependable electrical energy system in the world, and it's the job of NERC and its regions, including ECAR, to keep it that way," stated Holland.

CG&E awards Zimmer coal-supply contracts

Cincinnati Gas & Electric Co. has announced that it will award three long-term coal supply contracts for its Wm. H. Zimmer Generating Station. Addington, Inc., Consolidated Coal Co. and Ohio Valley Coal Co. together will supply a total of 2.5 million tons of coal, according to CG&E. Zimmer, originally planned as a nuclear generating unit, is being converted to a coal-fired plant and is scheduled to begin operation in the spring of 1991. Owners of the plant include: CG&E (46.5%), Dayton Power and Light Co. (28.1%) and Columbus Southern Power Co. (25.4%).

NELPA officers chosen

The Northwest Electric Light & Power Association announced that it has selected its officers for the 1990-91 fiscal year. E. Kay Stepp, president and chief operating officer of Portland General Electric Co., was named president of the association. Larry R. Gunnoe and Richard R. Sonstelie will serve as vice presidents. Gunnoe is president and chief operating officer of Idaho Power Co. and Sonstelie is president and chief financial officer at Puget Sound Power & Light Co.

Miller named president at UE&C International

Charles Q. Miller was chosen as president of United Engineers & Contructors International Inc., a subsidiary of Raytheon Co. He replaces Gunnar E. Sarsten who resigned after seven years with the company. Miller most recently served as vice president and general manager of UE&C's Stearns-Roger division.

Utilities take part in tree-planting programs

A number of utilities have been participating in various tree-planting programs.

Metropolitan Edison Co. is sponsoring the Global ReLeaf campaign of The American Forestry Association. The campaign is designed to promote community forestry programs that reduce energy demand and cut air pollution. "The Global ReLeaf program will complement Met-Ed's continued environmental commitment programs such as the Municipal Tree Restoration, Single Tree Replacement, and Street Tree Factsheets," explained Met-Ed Forestry Manager Eric S. Ulrich.

The Sacramento Municipal Utility District said it has joined in a partnership with the Sacramento Tree Foundation to help the foundation reach its goal of planting one million trees. The partnership's Shade Tree Program is part of a conservation plan by SMUD to reduce energy consumption throughout the Sacramento area. The trees that are planted will provide shade and evaporative cooling in the summer, according to SMUD.

Kansas Gas and Electric Co. has initiated a program to plant trees in conjunction with the Dwight D. Eisenhower Centennial. The trees, grown from seeds harvested at Eisenhower's home, are being planted in recognition of Eisenhower as a, "soldier, president, statesman and Kansan," according to Don Elliott, KG&E Regional Manager-Wichita.

Six awarded by DOE for atomic energy work

The U.S. Department of Energy recently presented six E.O. Lawrence Awards to scientists and engineers for their contributions to the developemnt, use or control of atomic energy. Recipients of the award included: John J. Dorning, University of Virginia; James R. Norris, Argonne National Laboratory and the University of Chicago; S. Thomas Picraux, Sandia National Laboratories; Wayne J. Shotts, Lawrence Livermore National Laboratory; Maury Tigner, Cornell University; and F. Ward Whicker, Colorado State University.

Utilities win APPA annual report awards

The American Public Power Association has announced the winners of its annual report contest. Santee Cooper won first place and Ontario Hydro won second place, for electric utilities with gross revenues exceeding $400 million. In the category of electric utilities with $175-400 million in gross yearly revenues, Tacoma Public Utilities was first and the Lower Colorado River Authority received second. APPA said the reports were judged on basis of written text, design, photography, clarity of financial data, organization, ingenuity and imagination, layout printing, and appropriateness for intended readers.

NSC's Public Utilities Section celebrates 75th

The National Safety Council reported that the public utilities section of its industrial division recently celebrated 75 years of service to safety. Since the section was founded in 1915, members have worked to reduce the number of accidental deaths and injuries related to the public utilities industry, both on and off the job. According to the NSC, each of its sections studies safety and health problems within its industry to produce information on accident control measures.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Ariz. Nuclear Power Project
A $75,000 fine for alleged violations of NRC requirements involving medical records of licensed reactor operators at the Palo Verde Nuclear Generating Station. ANPP also received a $125,000 civil penalty for apparent violations involving its emergency lighting system.

Carolina Power & Light Co.
A $62,500 civil penalty for alleged violation of NRC requirements at the Brunswick nuclear power plant. The violation relates to an incident in which two individuals were exposed to radiation during the installation of core reactivity detectors and cables at the plant.

Duke Power Co.
A $25,000 fine for failing to correct a design error with some flow control valves in the ventilation system at the Oconee Nuclear Plant.

Georgia Power Co.
A $40,000 civil penalty for alleged violation of NRC requirements at the Vogtle nuclear power plant. According to the NRC, Georgia Power failed to make offsite notifications of emergency conditions in a timely manner.

GPU Nuclear
A $75,000 fine for alleged violations associated with requalification examinations of two NRC-licensed reactor operators at the Oyster Creek nuclear plant.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Kansas P&L and Kansas G&L sign merger agreement, snub KCP&L. 1
Illinois Power mixes tires with coal. 3
Utilities agree to various power supply and delivery deals. 4
Attention to quality is among top utility strategies. 8
Big green gets cut down to size. 9
UPMG Focuses on partnerships. 9
Sales and revenue grew in the second quarter, but earnings were flat. 14

GENERATION TECHNOLOGY

Tampa Electric engages environmentalists in plant siting decisions. 16
East Kentucky solves flyash control problems at coal plant. 16
Power-Gen '90 to run Dec. 4-6 in Orlando, FL **(Special Report)**. 20
More Clean Coal Technology Projects are awarded. 40

T&D TECHNOLOGY

DA/DSM symposium focuses on real-world potential. 28
Security system marketing ups revenues for co-op. 28
T&D maintenance seminar emphasizes safety, cost. 30
Database converts easily to other CAD formats. 31
Weather-related data crucial to operations **(Special Report)**. 33

REGULAR FEATURES

Commentary and **Letters** 4
Financial Performance 12
Information/Control Systems 14
Labor/Management Concerns 15
Marketing: Geothermal puts PSI back in heating market. 27
Readers' Service 37
Calendar 39
Bulletin Board 41
New Products 49
Regulatory Review 53
Management Methods 55

Restore the nuclear option

When the call came in, excitement bounded from the voice of News Editor Mark Hoske. According to an industry contact, a plan to build a new, advanced nuclear plant would be unveiled at the Nuclear Energy Forum in Washington, then underway in mid-November.

The prospect of a new nuclear plant, after a hiatus of nuclear plant orders for more than 12 years, certainly caused an adrenelin rush. But followup showed that the tip overstated the actual story. The next day, formal announcement came from the Nuclear Power Oversight Committee (NPOC), comprised of representatives of the eight major electric- and nuclear-industry associations and seven individual energy industry leaders. It turned out to be a plan to improve the *conditions* that could lead to an order for an advanced reactor plant in the mid-1990s, with operation to begin by the year 2000.

While the reality was a far cry from the anticipated, the development is noteworthy. More importantly, it just might work.

"A Strategic Plan for Building New Nuclear Plants" called for the achievement of 14 specific goals divided into four functional groups:

First, present operators of nuclear facilities need to continue and improve safe, economic and reliable operations. Progress toward establishment of a spent-fuel storage facility, increased low-level waste-disposal capacity and a stable, economic supply of uranium fuel also must be pressed.

Second, generic regulations and industry standards will be sought. This requires establishing a predictable regulatory environment, with plant licensing to precede actual construction. (This suffered a recent set back, see p. 1). The Nuclear Regulatory Commission, the Environmental Protection Agency and state government agencies must determine and agree upon their respective mutually exclusive roles and jurisdictional limits.

Third, technical functions of new plant designs must be developed and tested. Form and function of siting and regulatory review procedures need agreement. The program's goal is to build and operate groups of essentially identical plants with optimum safety, efficiencies and economics.

Finally, the plan calls for continued efforts to gain public acceptance of nuclear power by building local support for potential plant sites, and encouraging state regulatory reform to bring economic predictability to new nuclear projects, enhance government support and develop a viable structure for financing new nuclear projects.

The program emphasizes improved communications throughout.

So what's so new? What's so good about this "plan"? Aspects of the program echo previous efforts. The new part is that a specific organization accepted responsibility for achieving each of the 14 specific requirements. And with each responsibility goes a timetable.

Strategic plans, far from certain, provide focus. In this case, the final result—initiating a new nuclear power plant construction program—depends on success of 14 component requirements. But at last, the industry has coalesced to achieve a common, defined goal, ending the diffusion of interests and talents pursuing separate agendas.

Will it work? We'll know in just a few years. If a new nuclear plant operates by 2000, the first elements of NPOC's program must be achieved by 1992. If the electric utility industry hopes to meet its long-term responsibilities, let's pray NPOC's plan becomes reality. Then, newsrooms all over the country will confirm the long-overdue story of a new nuclear plant order.

Robert A. Lincicome, Editor-in-Chief

Next stop, global warming?

The new clean air law has the "Green" bandwagon rolling at breakneck speed. The utility industry should jump on before it gets run over again. The next save-the-world effort may turn the helm toward cuts/caps on CO_2 emissions in the name of Global Warming. This may further restrict environmentally sound clean-coal efforts and waste vast strategic U.S. coal resources. Jump on the Green bandwagon: reposition as part of the solution, highlight environmental/efficiency efforts, and support research on the *theory* of global warming.

Mark T. Hoske, News Editor

EL&P

ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher

Robert A. Lincicome
Editor-in-Chief

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
B. J. Davidson, Assistant Editor
Dianne Wilson, Editorial Assistant-Products/Literature
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $4 + postage ($7 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402. (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

O_2 and CO_2 in the atmosphere

In response to N.D. Sadanandan's letter on the relationship between atmospheric oxygen and carbon dioxide in the October issue:

The current concentration of CO_2 in the atmosphere is about 330 ppm or 0.033 percent by volume (not weight). The current concentration of oxygen is about 209,000 ppm or 20.9 percent. Even if the CO_2 concentration were to double to 660 ppm, it would reduce the oxygen concentration to 208,607 ppm, which rounds off to 20.9 percent.

This reduction is insignificant compared to the warming effects such an increase in CO_2 would bring.

Alan J. Weinrich, CIH
Senior Industrial Hygienist
PSI Energy
Plainfield, IN

Oil dependency

Enclosed is information based on Energy Information Agency reports that reveals a couple of errors in your October issue article.

- 42.1 percent of America's energy comes from oil.
- 44.9 percent of America's oil is imported.
- 18.9 percent of America's total energy is from imported oil. Apparently free markets have worked to select not only a wide range of oil sources but also the lowest dollar [cost] per MMBtu.
- Only 26.5 percent of the oil imported into America comes from the Middle East.

Thanks for pointing out that utilities use very little oil. Perhaps we should emphasize that nuclear is the second largest source of electric generation, and that the United States leads the world in nuclear electric power, producing almost twice as much as France.

Nick Schroeder
Colorado Springs, CO

Editor's note: Thanks to reader Schroeder for reiterating these facts. The charts he enclosed also shed additional light on the imported oil situation as it affects electric utilities:

Slightly less than 5 percent of oil-based energy is used by U.S. electric utilities to generate electricity, and less than half of that is from offshore. Moreover, of the offshore portion, less than a quarter is from Arab states and more than half of that is from Saudi Arabia. In other words, the amount of oil from non-friendly Arab nations is minute.

Reader Schroeder makes a strong point about U.S. nuclear power also. Unfortunately, although the U.S. has a healthy superiority in nuclear electricity output, nuclear's share of U.S. output will increase only slightly in the future as the last few nuclear projects under construction are completed. France, substantially smaller in size and population than the U.S. but with few domestic resources from which to generate electricity, derives a much larger portion of its electricity from nuclear energy than the U.S. Moreover, the French nuclear program, although slowed over the past couple of years, remains a viable option for the future.

Power delivery, supply

Portland General acquires IPP interest; construction plans; bids

BARRINGTON, IL—Power supply and delivery deals and transmission access top recent news.

Relating to bidding, power plants, or production:

- Portland General Corp. (PGC) acquired 20 percent of Bonneville Pacific Corp. (BPC), an independent power producer headquartered in Salt Lake City, for $34 million, Oct. 2. PGC has a three-year option to acquire up to 49 percent of BPC stock. As part of the agreement, PGC's President Richard B. Reiten and two other executives were appointed to the BPC board of directors. BPC, an independent energy developer, has developed or acquired 29 projects for 214 MW. It now has 153 MW in projects. The investment "fulfills our corporate strategy to acquire a well-regarded company with an established presence in the independent power production business," said Reiten.
- Wisconsin Power & Light Co. and Wisconsin Public Power Inc. System announced the signing of more than $73 million in contracts to purchase up to four GT-11N combustion-turbine generators from ABB Energy Services Inc. of North Brunswick, NJ.

The two utilities plan to install the natural-gas-fired peaking units at WP&L's South Fond du Lac substation, subject to regulatory approval. WPPI would install the first 82-MW unit by 1993, WP&L, two units by 1994 and an optional unit in 1996.

Burns & McDonnell Engineers-Architects-Consultants, based in Kansas City, MO, will provide engineering services.

- Oglethorpe Power Corp. expects to complete evaluation of 36 bids totalling 7200 MW by January 1991 for a 700-MW generating capacity request for proposal. The Atlanta-based generation and transmission cooperative received bids for 4500 MW fueled by natural gas, 1500 MW by coal, 900 MW in off-system sales, with oil-fired and other fuel types making up the rest.

Of the 36 bids, qualifying facilities account for 18, 13 are independent power producers, and five are utility projects.

- Minnesota Power Co. completed the sale of 20 percent of its 500-MW coal-fired Clay Boswell Station Unit 4 to The Wisconsin Public Power Inc. System (WPPI) of Sun Prairie, WI, for $84 million. Regulatory and company approvals were completed in September. WPPI made wheeling arrangements. The sale should add 38 cents/share to MP's 1990 earnings.
- Pennsylvania and New Jersey regulatory filings started in October for previously announced agreements that will reopen a coal-fired power plant near Pittsburgh and construct a 200-mile, 500-kV power line across the western half of Pennsylvania. General Public Utilities Corp. utilities will purchase half of the Phillips Station plant, owned by DQE's Duquense Light Co. The plant, closed in '87, is to reopen in '94.
- Palo Verde nuclear Unit 1 was returned to service Sept. 24 following an

Continued on page 10

Interregional connections, lost capacity may hurt reliability

PRINCETON, NJ—Regional electric reliability concerns in the next decade range from impacts of acid-rain compliance in the east-central U.S. to recent limitations in certain interregional connections for emergency assistance, according to the North American Electric Reliability Council.

U.S. electrical peak demand is projected to grow at 2 percent per year, 1990-99. The U.S. will remain summer-peaking, exceeding winter peaks by 11 percent, NERC said. Canada will stay winter-peaking with 2.2 percent growth over the nine years, exceeding summer demand by 39 percent. These rates are weather-normalized, average annual rates, NERC said.

1990-1999 Forecast of Peak Demand and Energy

United States	1990	1999	1990-1999 (%/yr)
Summer Peak Demand[a] (Thousands of MW)	539	646	2.0
Annual Net Energy for Load (Millions of MWh)	2890	3476	2.1
Canada	**1990/91**	**1999/00**	
Winter Peak Demand[a] (Thousands of MW)	79	96	2.2
Annual Net Energy for Load (Millions of MWh)	432	543	2.6

Note: Figures are rounded. Percentages are based on complete data.

[a] Forecast uncertainty is illustrated in Figures 1 (U.S.) and 2 (Canada).

Source: NERC

Clean air legislation and other issues may hamper U.S. reliability, warned NERC (*EL&P*, Nov., p.3).

Regional concerns

Acid-rain compliance will impact about 50,000 MW of capacity in the East Central Area Reliability Coordination Agreement (ECAR). Potential impacts on generation availability and the influence of proposed emission caps on inter-utility emergency assistence are "serious concerns," NERC stated in its "1990 Reliability Assessment." Peak demand dropped 4.7 percent 1988-89, the greatest decrease of all regions.

Electric Reliability Council of Texas (ERCOT) reported that construction delays of critical 345-kV transmission lines and dependence on natural-gas-fired generation are major concerns for continued reliability.

Mid-Atlantic Area Council (MAAC) said recent limitations in interregional transmission systems have rendered MAAC unable to receive desired levels of emergency assistance from neighboring regions. MAAC may need additional generation if assistance from other regions declines.

Mid-America Interconnected Network (MAIN) said probability studies indicate that with demand forecast error and weather uncertainties, capacity additions may be needed as early as 1996.

Northeast Power Coordinating Council (NPCC) expects to need 2460 MW of added generation or demand-side resources 1995-99 beyond what is already planned.

Southeastern Electric Reliability Council (SERC) warned that if peak demand growth continues to exceed forecast, supply deficiencies could quickly develop. SERC's peak demand grew the most of all the U.S. regions, up 1.6 percent 1988-89.

MAPP's Canadian peak demand (winter) increased 9 percent, the largest increase overall.

Lighting for and around computers

NEW YORK CITY—A new lighting guide addresses the needs for proper lighting of computer terminals and surrounding areas. As a Recommended Practice, it examines lighting requirements for both visual comfort and good visibility at length, with an analysis of the impact of general lighting on those performing visual display terminal (VDT) tasks.

It also discusses general lighting requirements for offices containing VDTs and viewing problems caused by daylight. Various systems for direct and indirect lighting methods are examined.

Recommendations are a consensus of the opinions of Illuminating Engineering Society of North America Office Lighting Committee members, supported by applicable research.

"VDT Lighting—The IES Recommended Practice for Lighting Offices Containing Computer Visual Display Terminals," 32 pages, paperbound; $25 to members, $35 to nonmembers.

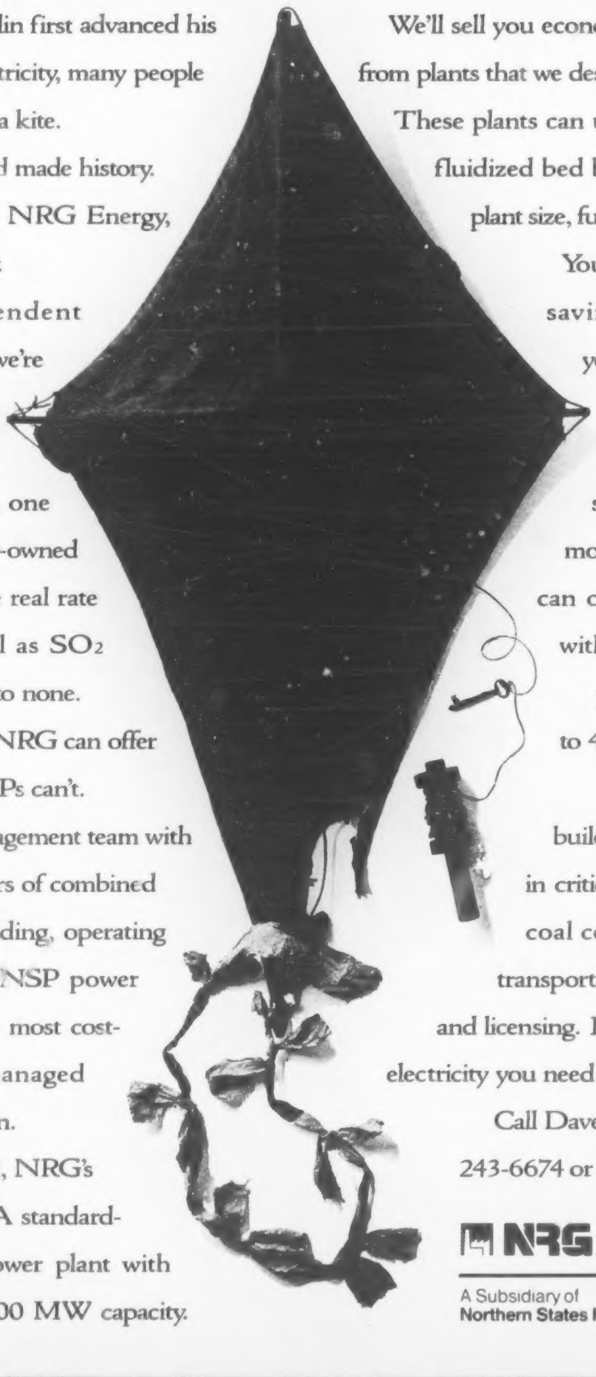
Order from: IES Publication Sales, 345 E. 47th St., New York, NY 10017;

New training course available from TEC

WASHINGTON, DC—The Electrification Council's updated and expanded seventh edition of the *Industrial & Commercial Power Distribution* is now available for use by utilities in their technical training and marketing support programs.

The course has been expanded from 10 to 16 chapters and updated to conform with the 1990 National Electrical Code. A new instructor's workbook, developed by James Litzinger, Pennsylvania Electric Co., uses a cookbook approach to help solve energy-related problems.

For more information contact: The Electrification Council, 701 Pennsylvania Ave., N.W., Washington, DC; phone 202/508-5900.



FOR CENTURIES, AMERICANS HAVE SEARCHED FOR WAYS TO EFFECTIVELY PRODUCE ELECTRICITY.

When Ben Franklin first advanced his notions about electricity, many people told him to go fly a kite.

He did. And made history.

That's what NRG Energy, Inc. is doing today.

An independent power producer, we're a subsidiary of Northern States Power Company, one of the few investor-owned utilities to achieve real rate reduction as well as SO_2 reduction second to none.

That's why NRG can offer you what other IPPs can't.

First, a management team with more than 75 years of combined experience in building, operating and maintaining NSP power plants, among the most cost-effective, best-managed plants in the nation.

And second, NRG's Reference Plant. A standardized coal-fired power plant with either a 200 or 400 MW capacity.

We'll sell you economically-priced power from plants that we design, build and operate. These plants can use pulverized coal or fluidized bed boilers, depending on plant size, fuel supply and financing.

You'll realize substantial savings versus building your own plant.

And because our plant design is standardized and uses modular components, we can complete construction within 32 months, compared to the usual 40 to 48 months.

Best of all, NRG will build on NSP's leadership in critical areas like long-term coal contracts, economical transportation, pollution control and licensing. In short, you'll get the electricity you need at the right price.

Call Dave Peterson at 1-800-243-6674 or 612/330-6745.

NRG Energy, Inc.

A Subsidiary of
Northern States Power Company

Inquire R.S. 6

SR1

C6985-6

ELECTRIC LIGHT & POWER

EL&P

JANUARY 1991
Volume 69, Number 1
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

The NRC cuts public radiation exposure limits by 80% around nuclear plants. Long Island Power Authority submits a $186-million plan to dissect Shoreham's licensed and unused $5.5-billion nuclear unit. Details in Feb.

EPA Admin. William Reilly says he'll work with the DOE, Council of Economic Advisors and Acid Rain Advisory Committee.

UtiliCorp United agrees to buy Centel's Kansas and Colorado electric utilities for $346 million.

INSIDE: Forecast 1991-5, p.18.

Clean Air Amendments of 1990

Utilities aim at fuzzy target

Mark T. Hoske
News Editor

WASHINGTON—There are only 1000 shopping days left before utilities face the first major compliance deadline for the Clean Air Act Amendment in four short years, Jan. 1, 1995, Phase I.

Shop early. Edison Electric Institute estimated that a utility starting scrubber permitting today may not achieve commercial operation until December 1996 (within the 1997 deadline).

There will be crowds. Phase 1 will affect 111 units altogether. In Phase I, utilities will add scrubber retrofits to 18,000 MW of generation, 36 units, at a total installed cost of $4 billion, said EEI. Others may scrub early.

Phase II scrubber retrofits could cover 30,000 MW, 60 units, at a cost of $6.75 billion by the year 2000.

And it will be expensive. The entire package, made law Nov. 15., could cost $25 billion/year, ultimately (*EL&P*, Dec.'90, p.1,7). Some estimates are much higher.

Total utility capital costs to meet the Phase I, 1995, deadline utilities may top $2 billion. Nine years from now, Phase II compliance, cumulative capital-investment costs could jump to $18 billion, according to some industry estimates. Utility sulfur dioxide emissions in the year 2000 will drop by half (to 9-million tons) from 1980 levels.

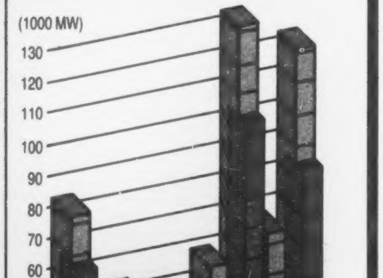
A whole litany of deadlines fall before, after and between those dates (see p.12 for requirements and dates).

Continued on page 12

Related Coverage

Acid Rain Advisory Council, p.3
Clean Air Working Group, p.10
Compliance deadlines, p.12

ESTIMATED WINTER 1990/91 NERC REGIONAL ASSESSMENTS



Source: North American Electric Reliability Council

Can emission trading work?

INDIANAPOLIS—At the extremes, the complex system of sulfur-dioxide emission credits trading could bring fortune for some utilities and financial hardship for others. For all, it will be a prudency issue with regulators.

Because of impending compliance deadlines, decision-making needs to be swift, integrated across utility departments and well-documented, say various experts.

Because of the Clean Air Amendments signed into law Nov. 15, utilities face a "radically different regime," said Andy Weissman, Swidler & Berlin, as part of a recent seminar here in November on emissions trading. "Not all companies realize the scope of the changes required.

"There are utilities represented in this room that will suffer major prudence disallowances before this [Clean Air compliance] is all over," he said.

With 700-pages of law, and regulations still forthcoming, "Utility regulatory commissions will have plenty of opportunities to second guess. You must get commissions to sign off on what you're doing to comply [with]."

Grim faces and nervous laughter at the sessions accentuated the expanse of the new law and the difficulty of proper and cost-effective compliance.

Many of the 80 people attending The Clean Air Act Amendments Seminar would be the ones facing criminal penalties if their companies violate the law. About 25 operating utilities were represented. Swidler & Berlin, AER*X Inc., and Energy Management Associates Inc. (EMA) sponsored the Nov. 16 meeting.

Successful compliance

Weissman said successful compliance with the new law:

- Mandates use of system-wide resources and analysis way beyond current efforts.
- Requires utilities to rely on financial and rate experts as much as technical ones to achieve least-cost compliance. Unit-specific solutions may not be the

Continued on page 12

'91 spending to fall, '92-'95 outlook good

BARRINGTON, IL—Capital spending for the nation's electric utilities—investor-owned, co-op, municipal, federal and other public units—is projected to increase in the five-year period 1991-1995. But the upturn won't begin until next year.

Capital spending in 1991 is projected to drop some 8.7 percent from actual 1990 investment in new and improved facilities. Current-year spending is projected to be $26.1 billion.

Overall, electric utility capital spending is projected to total $132.5 billion through 1995. This represents an increase of 3.8 percent as compared to the 5-year projection made last year.

These are two of the major trends revealed in *EL&P's* annual survey of electric utility capital spending and plans, completed last November.

The survey indicated that the nation's electric utilities will step up their generation expansion and improvement programs by about $5.0 billion over the five years, or 9.8 percent.

At the same time, expansion and improvement of transmission and distribution systems will just hold its own, compared with last year's 5-year projection, increasing only 0.7 percent.

Other spending will decline by 3 percent during the period, to $15.3 billion.

As a result, generation spending during the period will represent a larger, but still minority percentage of total spending during the period. Generation spending will average 41.4 percent of capital investment each of the years.

Power delivery investment remains the largest investment activity area. Spending here will average 47.1 percent of total capital spending. Other spending will average 11.5 percent.

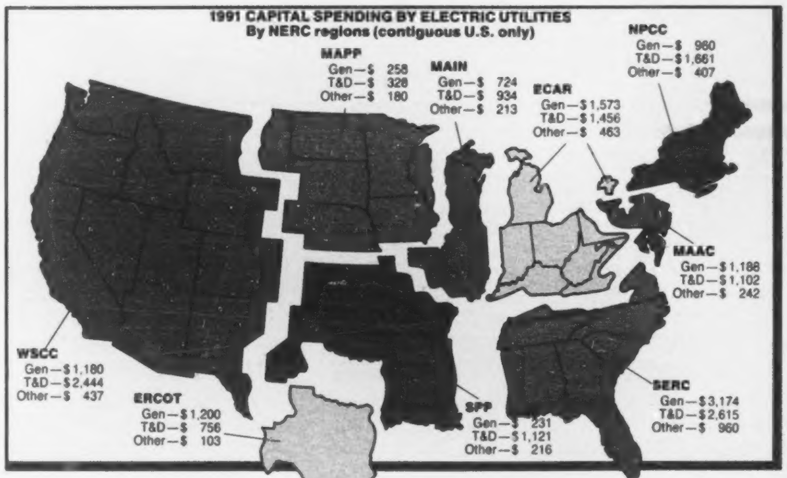
It is important to note, however, that the 5-year average share of investment devoted to generation during the present 5-year period is up from just a year ago, when it was 39.4 percent.

The 1991 study also showed utilities' continued preference for small units, mostly under 200 MW for the next five years. Combustion turbines remain the primary choice. Only seven baseload steam units are currently planned.

The fuel of favor is natural gas (47 of the "next" units), followed by oil (13 units). Coal (four units) is third.

Survey participants reported increased reliance on non-utility sources to meet system demand. Currently they report 13,421 MW of independent power produced energy under contract. Energy amounting to 15,559 MW is under contract with cogenerators.

1991 CAPITAL SPENDING BY ELECTRIC UTILITIES
By NERC regions (contiguous U.S. only)



******************5-DIGIT 20814
41001273O2*010191T 000000 1446
SUITE 800 COPY # 1
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

NEWS BRIEFS

JILL MINNER, Special Projects Editor

FERC ruling to lower SMUD power costs

The **Sacramento Municipal Utility District** (SMUD) reported that the Federal Energy Regulatory Commission has ruled in favor of SMUD on some key transmission issues, which will in turn save the district money and give it broader access to power from other areas. The ruling affects transmission rate agreements between SMUD and **Pacific Gas & Electric Co.** SMUD said it will now pay $0.65 per kW/month as opposed to the $1.77 that PG&E wanted to charge for firm transmission service for power imported by SMUD from **Southern California Edison**. "The lower rate will save the district $2 million to $3 million a year," explained SMUD General Manager David Freeman. According to SMUD, FERC will also allow the district to export electricity to markets in the south without having to pay twice for transmission access. "The interruptible rate and broader access to competitive markets can help us hold the line on rates to our customers," Freeman added.

Nuclear Regulatory Commission sets fines

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Illinois Power Co.

A $112,500 fine for two violations of NRC safety requirements at the Clinton nuclear plant. The violations are related to the inoperability of the plant's two primary emergency diesel generators.

Pennsylvania Power and Light Co.

A $25,000 fine for alleged violations associated with deficiencies in evaluating and environmentally qualifying equipment in the Susquehanna Steam Electric Station, and failing to promptly correct those deficiencies once they had been identified.

U.S., Finland agree to information exchange

The United States and Finland recently agreed to an energy research and information exchange. Signing the five-year cooperative agreement in Washington were Bror Wahlroos, General Secretary, Finland Ministry of Trade and Industry, and John J. Easton Jr., U.S. Department of Energy Assistant Secretary for International Affairs and Energy Emergencies. The Office of Technical Assistance, Conservation and Renewable Energy will coordinate implementation of the agreement, according to DOE.

Idaho Power, Montana Power sign $65-million power supply contract

Idaho Power said it has signed a $65-million contract to provide **Montana Power** with a limited supply of electricity through early 1996. Under the agreement, which went into effect Dec. 1, 1990, Idaho Power will supply Montana Power with 75 MW from October through March of each year, and 25 MW from April through September. The contract ends March 31, 1996 and calls for annual deliveries of 437,450 MWh to Montana Power, with total sales of 2.4 million MWh during the term of the contract. According to Larry Crowley, Idaho Power manager of power management, the contract requires no new transmission service agreements or facilities. Crowley also said that deliveries to Montana Power may be interrupted if Idaho Power is unable to meet the demands of its own retail customers.

WEPCo receives final state approval on t-line

Wisconsin Electric Power Co. said it received final state approval for its $40-million Presque Isle to Quinnesec, MI transmission line project. "We're pleased that the Public Service Commission of Wisconsin approved a certificate of authority for us to begin work on the 80-mile line," stated Neil Palmer, WEPCo senior legislative representative for local relations. The line will run west and south from the Presque Isle Power Plant in Marquette, MI to join an existing line near Gwinn, MI. From there the new line will parallel the existing line south to the company's Plains substation at Quinnesec. "We hope to select a contractor soon to build the line," added Palmer.

CIPS plan sees no need for additional capacity

Central Illinois Public Service Co. (CIPS) predicts it will need to build no additional electric generating capacity within the next 20 years, according to a plan approved by the Illinois Commerce Commission. The utility's first least-cost energy plan covers almost all of its planning, investment and operations activities through 2010. CIPS predicts that, even if it sustains higher-than-ex-pected load growth, it should be able to satisfy customers' demands through conservation strategies or by buying excess electricity from other Midwestern utilities.

In addition to approving the plan, the ICC ordered CIPS to take a more aggressive approach to selling its surplus generating capacity, and to file a report detailing its long-term goals and strategies for sales of capacity to other utilities.

Minnesota Power says business is 'sound'

Minnesota Power Chairman, President and CEO Arend J. Sandbulte recently told the New York Society of Security Analysts that the utility's core electric business is "sound" and that, "Because of our strong competitive position, we think we have opportunities to expand our energy business in non-conventional ways such as cogeneration and the sale of other energy- or resource- conservation services in the region." Sandbulte also reported that the utility expects record kWh sales in 1990 and it does not plan to file for higher electric rates "until sometime in 1991, if then."

Minnesota Power is "in good shape" environmentally and anticipates little trouble complying with new federal clean-air laws aimed at reducing acid rain and nitrous oxides, because the company's major power plants burn low-sulfur coal and are equipped with scrubbers, according to Sandbulte. In addition, Minnesota Power balanced its supply and demand for the next decade recently, when the utility sold its 100-MW interest in the Clay Boswell power plant to **Wisconsin Public Power**.

Personnel briefs

Harold N. Scherer Jr. was appointed president and chief operating officer of **Commonwealth Energy System's** electric division. Scherer was formerly senior vice president of electrical engineering for **American Electric Power**.

Kansas City Power & Light Co. announced the appointment of Drue Jennings to chairman of the board. Jennings, who will continue to serve as president and chief executive officer, succeeds Arthur J. Doyle. Doyle will remain a member of the board of directors.

Jay S. Pifer was named president of **West Penn Power Co.** He replaces the retiring Richard S. Lashley.

The **Los Angeles Department of Water and Power** has chosen Daniel W. Waters as general manager. Waters takes over from Norman E. Nichols who has retired.

Richard J. Slember was selected as president, power plant businesses and executive vice president of Asea Brown Boveri Inc.

Philadelphia Electric Co. Chairman and CEO Joseph F. Paquette Jr. was elected to the board of directors of the Institute of Nuclear Power Operators.

South Carolina Electric & Gas Co. named Bruce D. Kenyon president and chief operating officer. Kenyon, who replaces the retiring T.C. Nichols Jr., was previously senior vice president-division operations at **Pennsylvania Power and Light Co.**

Branko Terzic was sworn in as a Federal Energy Regulatory Commissioner completing the five-member commission. Terzic, an engineer and former Wisconsin Public Service Commissioner, most recently served with the Milwaukee-based AUS Consultants.

The Institute of Electrical and Electronics Engineers, Inc. elected Merrill W. Buckley Jr. 1991 president-elect. Buckley is manager of program planning for the electronic systems division of GE Aerospace and Defense.

Robert C. Franklin, chairman, president and CEO of **Ontario Hydro**, was reelected chairman of the governing board of the World Association of Nuclear Operators-Atlanta Center.

Area utilities sponsor conservation program for home construction

The **New England Electric System, Boston Edison** and **Eastern Utilities Associates** are jointly sponsoring the New England region's first program to encourage construction of energy-efficient homes, condominiums, and multi-family dwellings with builder training and incentives.

The Energy-Crafted Home (ECH) program offers interested contractors a two-day informational workshop on energy-efficient building methods and material standards. Utility representatives then work with contractors to review building plans and determine a new unit's energy needs. Upon completion of one approved unit, a builder becomes a registered ECH contractor and is reimbursed for a portion of ECH-related building costs.

"Basically, the ECH program supplements current state building codes to include design and construction specifications for energy-efficiency," explained James Sugden, ECH program administrator for Boston Edison. "We feel an ECH home will be more attractive to a buyer and estimate a homeowner could save up to 30 percent on heating and cooling costs."

APS seeks reduction of civil penalty from NRC

Operators of the Palo Verde Nuclear Generating Station have asked the Nuclear Regulatory Commission for a reduction of the $75,000 civil penalty that the NRC proposed. Palo Verde said it had been cited for: 1) failure to notify the NRC regarding licensed operators who had developed potentially incapacitating medical conditions; and 2) inaccurate certification to the NRC that candidates for operator licenses had received complete medical examinations. William F. Conway, executive vice president-nuclear of **Arizona Public Service Co.**, requested that the penalty be reduced by $25,000. In a letter to the NRC, Conway stated that Palo Verde management "recognized the importance of this issue and acted promptly to implement comprehensive programs to control not only the operator medical examinations but all facets of licensed operator qualifications."

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Clean Air: Prudency issues could influence sulfur-dioxide credit trading. 00
SDG&E/SCEcorp anti-merger decision: Companies object to advisory, non-final decision. 00
Utilities set more competitive bidding rules than states, says survey. 00
Rome Cable gets new life, commits to quality products and utility service. 27

T&D TECHNOLOGY

Computer system reduces storm outage time. 31
Substation shielding made easy with design software. 31
Telephone controls capacitor banks. 31
Mobile terminal increases productivity. 36

GENERATION TECHNOLOGY

TVA interconnects its nuclear plants with an upgraded telephone system. 38
Coal-derived liquid fuels may be just around the corner. 38
Zebra mussels stil spreading, but new methods may stop them. 39

REGULAR FEATURES

Commentary and **Letters** 4
Labor/Management Concerns 16
Financial Performance 26
Calendar, Rate Activity 42, 43
Information/Control Systems 44
New Products, New Literature 45, 48
Readers' Service 48A
Regulatory Review 51
Management Methods 52

COMMENTARY

The Administration and NES

Will the Department of Energy's just-completed National Energy Strategy (NES) survive long enough to guide the U.S. economy to a safe, energy-sufficient future? Should we move on to firm energy policy dictated by the Bush Administration? The manner in which members of the public, and groups of individuals, respond to these questions, and the viewpoints their proponents espouse, will largely dictate how well the U.S. will meet its energy and environmental responsibilities over the next two decades.

For more than a year and a half, the Department of Energy has conducted a series of hearings around the country to learn how individuals, industry and special interest groups view energy usage, conservation and the pros and cons of other energy options, and the nation's energy future. DOE now has stirred the massive collection of data it has accumulated, refined the recipe and baked it slowly until done. Neatly wrapped for the occasion, the NES is the sum and substance of 13 hearings, the testimony of 448 invited individuals, 631 additional documents filed with DOE and unsolicited comments from 1259 people—the synthesis of 219,000 pages of proceedings.

From comments and reports from special-interest organizations that participated in the hearings, few will find the NES uniformly acceptable. The NES is accused by consumer groups of being pro-big-business. Environmental groups see the world's resources sacrificed on an altar of energy profits. Petroleum interests see the NES favoring other interests in the energy industry. The coal industry believes there is too much concentration of oil- and other coal substitutes and not enough support for advanced coal technologies. Lack of DOE endorsement of many large special interests' goals and objectives has further slashed the ranks of supporters. Trying to please everyone may result in pleasing no one. The Administration itself, the instigator of the whole program, is not pleased. The *Wall Street Journal* reported the Administration's displeasure with NES' endorsement of tighter auto fuel-efficiency requirements and other proposals to reduce oil use. The Administration is said to want energy developments to be dictated by market forces. Powerful White House chief of staff John Sununu and economic adviser Michael Boskin have been especially critical of DOE's efforts.

A strategy is similar to a trip-plan. It is a series of guidelines governing actions to bring about achievement of an objective, just as a roadmap guides a traveler to the successful end of a journey. But you can't measure progress until you know where you're going; in both cases, there must be a specific goal. In the case of NES, the objective is a sane, sufficient energy future. To get there, it would seem, it will be necessary to eliminate wrong turns, roadblocks and unnecessary risk. Unfortunately, market forces result from external developments, leaving the security of the nation's energy future to unplanned, substantially increased risk. This includes the possibility of a post Jan. 15 Mideast war or international police action and destruction of major oil fields.

As this is being written on Dec. 22, President Bush should just be receiving his "exccutive copy" of the National Energy Strategy report from Energy Secretary James Watkins. Copies are not being made available to the media, at least officially, at presentation time.

Eventually, however, a National Energy Strategy will be announced and copies released to the press. It will be touted on TV, radio and internationally in high places. What will be made public seems bound to reflect the Administration's desires and *laissez faire* attitudes; it may not reflect the goals and objectives, and the steps to achieve them, that were the intent of DOE's hearing program. Like many corporate CEOs who hire "consultants" to legitimize the actions they already have decided upon—not find out what *should* be done—it appears that President Bush ultimately will shape U.S. energy policy with his own two hands. The President, with his propensity to shoot from the hip without clearly focusing on the target beforehand, will most likely leave the nation to respond to the same short-sighted, comfortable alternatives offered a decade and a half ago. And we will find ourselves in the same costly, confused mess a decade hence that we're in now.

The names may change, and the cost of "new" solutions will be astronomically higher, but ultimately the painful realities will have to be addressed.

Robert A. Lincicome, Editor-in-Chief

EL&P
ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher

Robert A. Lincicome
Editor-in-Chief

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
B. J. Davidson, Assistant Editor
Dianne Wilson, Editorial Assistant-Products/Literature
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112.

© Copyright 1990 by PennWell Publishing Company. All rights reserved.

Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President, John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $4 + postage ($7 + postage foreign). Available on the NEXIS* Service, Mead Data Central Inc., Box 933, Dayton, OH 45402; (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP

Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

Hydro Quebec's big savings

The article (Nov. *EL&P*, p.27)is a good technical discussion of solutions to an overvoltage problem but the article did not accurately state the true business case. I believe there is another story to tell about the value to Hydro-Quebec of this investment.

Hydro-Quebec did not save $1 billion. They chose a lower-priced alternative. If a company reduces its current operating expenses then it has "saved" money and increased net income. The same idea applies to saving three years in construction time. Hydro Quebec chose an alternative that had a faster construction time but it did not increase net income.

The real story is to be found in the effect this decision had on the expected life of system equipment and Hydro-Quebec's customers. The cost to the company of having to replace failed arresters or damaged shunt reactors could be calculated. The system instability could affect reliability of service to Hydro-Quebec's customers and cause a loss of revenue. These costs could also be calculated.

The loss of revenue, increased capital costs and reduced customer satisfaction are all potential results of the overvoltage condition. These costs could be used in a cash flow analysis along with the proposed $200 million investment. The resulting net present value and internal rate of return could be used for making a decision about whether to go ahead with the investment. The resulting cash flow would be a more accurate estimate of the cost savings to Hydro-Quebec.

I look forward to reading EL&P articles each month. Keep up the good work.

Richard Turnock
Information Resources
Portland General Electric
Portland OR

Selecting batteries

The article by Mr. Herritty (*EL&P*, Nov. 1990, p. 30) on selecting the right battery was both informative and interesting. However, he left out some of the recent, significant findings concerning lead-acid battery technology.

Extensive research during the past 20 years at AT&T Bell Labs has proved that pure lead as a grid material offers some distinct reliability and performance advantages over lead alloys.

The AT&T Lineage 2000 Round Cell, which uses pure lead grids pasted with Tetrabasic lead sulphate as an active material is warranted for 40 years at 77°F operating temperature.

This design is unique enough to create a fifth category to the four described by Mr. Herritty.

I disagree with his conclusion regarding the application advantage of NiCd batteries, especially when the Lineage 2000 has a 30-yr service life at a constant operating temperature of 90°F.

One can use either the first cost criteria or the life-cycle cost and prove that the pure-lead grid, round cell is economically more attractive than any NiCd battery.

J. R. Shroff
AT&T Power Systems

Nuclear council formed; U.S., Soviets agree on reactor safety

WASHINGTON—The International Nuclear Societies Council was recently created to promote cooperation, information exchange and meetings for nuclear energy professionals worldwide.

Representatives of the American Nuclear Society (ANS) and several international nuclear societies met here on Nov. 16, 1990, to create the new group.

Members

Members also plan to undertake joint actions to further development and use of nuclear science and technology for peaceful purposes.

Included in the meeting were representatives from ANS, the European Nuclear Society (a federation of 18 European nuclear societies), and nuclear organizations of Australia, Brazil, Canada, Japan, Korea, Mexico and Taiwan. They approved the INSC bylaws and elected officers for a two-year term.

U.S./USSR cooperation

The first work plans prepared jointly by U.S. and USSR nuclear power plant experts to improve operational safety of Soviet reactors were approved by officials from the two countries in charge of the program on Nov. 19, 1990.

The intitiative is being carried out under the auspices of the U.S./Soviet Agreement on the Peaceful Uses of Atomic Energy, administered by the Dept. of Energy and under the Memorandum Cooperation on Civilian Nuclear Reactor Safety, which is administered principally by the Nuclear Regulatory Commission.

Over the previous six months, the Institute of Nuclear Power Operations (INPO) and U.S. utility experts worked jointly with their Soviet counterparts to demonstrate U.S. practices to the Soviets.

The groups also jointly developed detailed plans to implement the practices at a Soviet reactor.

Working groups

Three working groups are involved in the efforts, covering operation instructions, training, and management and operational controls.

Pleased with progress

Said Assistant DOE Secretary William H. Young, who led the U.S. delegation, "I am pleased with the progress that has been made and in the cooperation that has developed between the two countries. The action plans call for specific products to be developed in the next year as well as the development of plans and schedules for implementation of these operation safety improvements at Units 3 and 4 at the Novovoronezh nuclear power plant site beginning by the end of 1991."

Emergency instructions

He continued, "During 1991, fundamental symptom-based emergency operating instructions will be prepared. A diagnostic instruction will be developed that can be used by operators following an incident to assess plant condition and to select specific instructions to control the plant...In addition, a technique for monitoring important reactor parameters will be established for use in verifying that operator actions are successfully stabilizing the plant."

Utilities lead in competitive bidding programs: survey

COLUMBUS, OH—Utilities almost always prefer doing something themselves over having regulators telling them how to do it—competitive bidding seems no exception.

A recent industry survey indicates that utilities were more likely than regulators to have developed competitive bidding rules for power supply options.

"Quite a few utilities have competitive bidding rules in place without a commission having anything to do with it," said Ken Rose, of the National Regulatory Research Institute (NRRI). "It was kind of surprising." Thirty-three percent of utilities surveyed had rules in place, while 16 percent of state regulatory commissions did.

The North Atlantic area, with 12 states, had the most activity in the survey. Six states and 10 utilities there developed rules. The survey included 49 commissions and 86 investor-owned utilities.

Despite an increasing trend toward bidding rules, "There may be times when competitive bidding is not the most appropriate means" to obtain new resources, Rose warned about mandatory bidding. It might be inappropriate for regulators to force a bid under certain circumstances, or sometimes the utility might determine when bidding would be best, the report cautioned.

NRRI, the research branch of the National Association of Regulatory Utility Commissioners (NARUC), expected to release the study outlining these survey results in December 1990, Rose said.

Rose covered the report on implementing competitive bidding for the Staff Subcommittee on Electricity, at the 102nd Annual Convention of NARUC.

Details differ

Utilities and state regulators differed in details on bidding plans. The survey indicated that utilities were more likely than regulators to favor voluntary over mandatory bidding, allow the host utility to bid, and allow other utilities to bid.

Regulators favored setting guidelines for requests for proposal (RFPs), not precluding any generation, and not setting a maximum or minimum size for bids.

On disclosure practices, regulators appeared more likely than utilities to make selection criteria, price, and participants' identity available before and after selection.

Competitive Bidding Among Public Service Commissions and Investor-owned Utilities
(N = 49 PSCs; 86 IOUs)

Current Stage	% PSCs	% IOUs
Rules in place	16	33
Draft in place	4	5
Developing draft	12	15
No rules	67	47
Experience		
Have held solicitation	14	20
Are conducting solicitation	6	18
Plan to conduct solicitation	10	11

Source: 1990 NRRI survey on competitive bidding.

With contract provisions, regulators were more likely than utilities to specify an unsecured property lien, other secured property interests, the right to take over in default, and specific operations and maintenance standards.

Utilities and regulators were equally likely, both 50 percent, to include demand-side options in bidding.

Incentives for bidding

While positive and negative points of bidding vary, commissions can devise regulatory and economic incentives for voluntary bidding, the study pointed out. Regulatory rewards for utilities using commission-guided bidding for capacity additions could include:

- Automatic prudency.
- Higher rate of return.
- Regulation of the price of electricity and not the cost, allowing utilities to seek lower-cost electricity and keep the difference.
- Mark-ups to the cost of purchased power, rather than pass through of costs.
- Allow utility to provide financial assistance to non-utility generators.

More information on the survey and report may be obtained from NRRI, Ohio State University, 1080 Carmack Road, Columbus, OH. 43210-1002; (614) 292-9404.

More EMF research underway in Texas

WASHINGTON—NEMA, the National Electrical Manufacturers Association, is funding a research project to find out more about possible health effects of electric and magnetic fields (EMF).

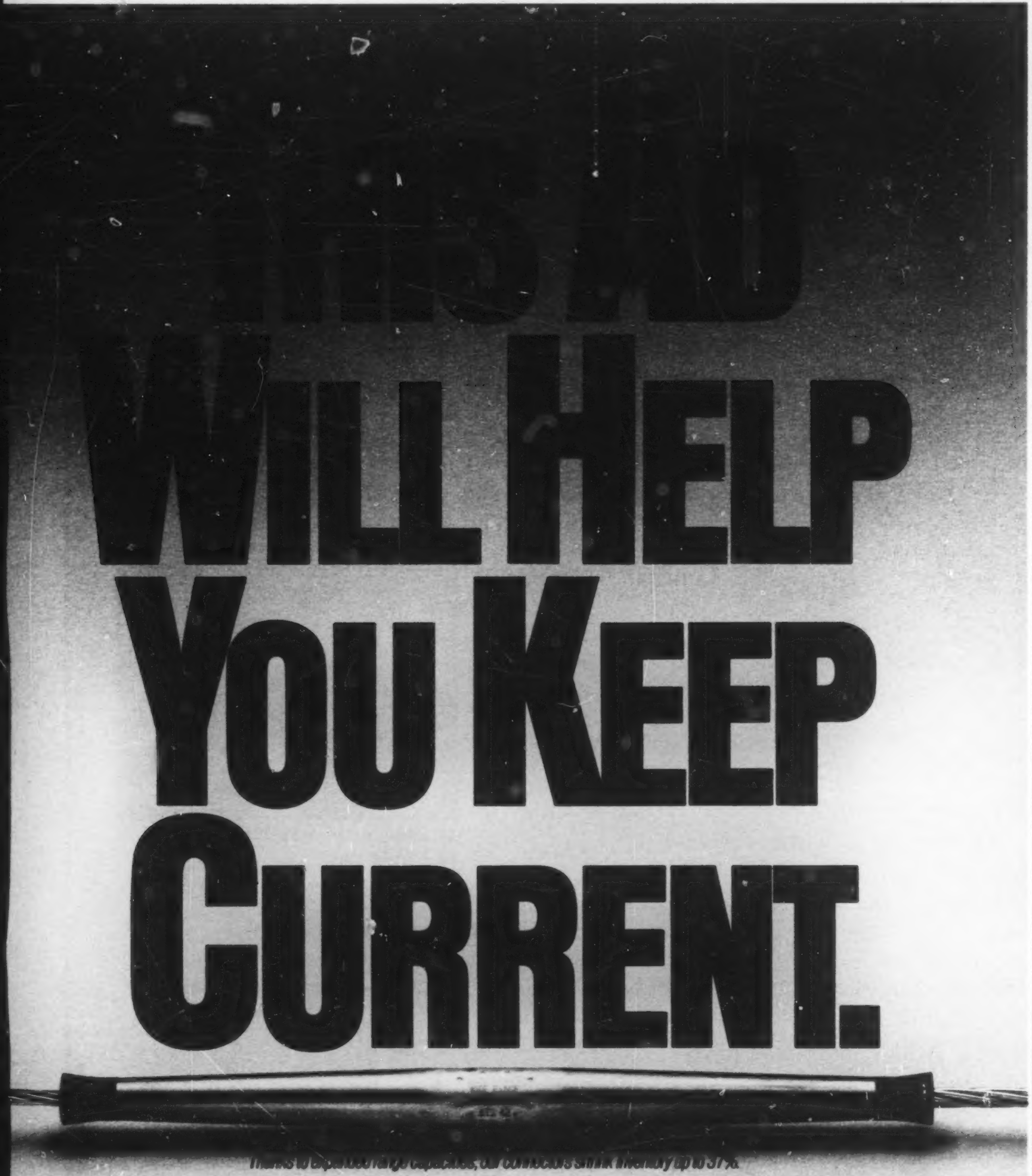
The contractor, Dermigen, a consulting group based at the University of Texas Cancer Center, will make a critical analysis of the literature describing research on magnetic fields as a cancer promotor.

It is generally accepted that cancer develops in two stages—initiation and promotion. Once DNA is damaged by an initiator, a promoter may cause cells to grow into tumors.

Some scientists have postulated that magnetic fields may be cancer promoters. The NEMA study will examine this work critically.

"Once the research analysis is available, there will be a clearer direction of the specific kinds of future research needed," said Dan Shipp, NEMA vice president of public affairs.

For more information contact: NEMA, 2101 L Street NW, Washington DC, 20037, (202) 457-8452.



Thanks to expanded range capacities, our connectors shrink inventory up to 37%.

Introducing the Blackburn Autoset™ automatic tension splice, the connector designed to reduce inventory.

And hassles.

A superior jaw design provides better fit over a wider range of conductor diameters. Which now means five splices replace our competition's eight. Plus the Blackburn ATS works with ACSR, AAAC, *and* AAC conductors, so there's no need to order a separate AAC line.

And, as you may have already noticed above, it can act as a reducer splice for certain size conductors. Also lessening the need for additional connectors.

Of course, each Blackburn connector comes with detailed instructions, color-coded labeling, and individual plastic packaging. So you have less to worry about on the job, too.

These days, it pays to keep up with less of everything. That's why it pays to keep current with the Blackburn Autoset™

Blackburn®
AMERICAN ELECTRIC
© 1990, American Electric, Memphis, TN (901) 682-7766.

Inquire R.S. 3

’91-’95 capital spending will climb

Survey says power delivery will get largest share of funds; actual 1990 spending topped projections.

Robert A. Lincicome
Editor-in-Chief

Improving financial conditions, predictable load growth and general optimism have combined to encourage the nation’s electric utility organizations to increase their construction and capital spending plans for the five-year period 1991-1995, according to *EL&P*’s annual electric utility industry survey.

As was true over the past several years, investment in transmission and distribution facilities will command the largest share of available funds.

However, relative investment in generating capacity is expected to increase in the last two years of the period, although its share of total spending will be below that indicated in last year’s survey.

Overall, this year’s survey indicates that the industry will spend about 4 percent more in the current five-year period than reflected in last year’s study. However, spending for 1991 is projected to be down more than 6 percent, from $27.9 billion to $26.1 billion, as compared with 1991 projections made in last year’s study.

On the negative side, while generation investment is slated to increase, more utilities are commiting to small combustion-turbine additions, with natural gas and oil as fuel. Only a handful of baseload units currently are planned.

EL&P’s survey of the electric utility industry—which covers all types of utilities—investor-owned, municipal, co-op, federal and other public organizations—was completed in November. Data was obtained from participants in all North American Electric Reliability Areas and was projected to represent total industry spending.

NORTH AMERICAN ELECTRIC RELIABILITY COUNCILS	
ECAR	East Central Area Reliability Coordination Area
ERCOT	Electric Reliability Council of Texas
MAAC	Mid-Atlantic Area Council
MAIN	Mid-America Interpool Network
MAPP	Mid-Continent Area Power Pool
NPCC	Northeast Power Coordinating Council
SERC	Southeastern Electric Reliability Council
SPP	Southwest Power Pool
WSCC	Western Systems Coordinating Council

1991 CAPITAL SPENDING BY NERC REGION
(Contiguous U.S. only—in millions of $)

Region	Generation	Substations	Transmission	Distribution	Other	Total
ECAR	$ 1,573	$ 150	$ 472	$ 834	$ 463	$ 3,491
ERCOT	1,200	111	162	483	103	2,059
MAAC	1,188	167	190	747	242	2,533
MAIN	724	39	284	611	213	1,871
MAPP	258	72	90	166	180	766
NPCC	960	312	302	1,047	407	3,028
SERC	3,174	519	546	1,550	960	6,748
SPP	231	192	307	622	216	1,569
WSCC	1,180	209	547	1,688	437	4,060
Total	$10,487	$1,770	$2,900	$7,746	$3,222	$26,125

CHANGING PATTERNS OF INVESTMENT
1991-1995

Function	1991	1992	1993	1994	1995
Generation	40.14%	40.04%	41.05%	43.30%	42.26%
T&D	47.52%	47.47%	47.13%	45.56%	47.77%
Other	12.33%	12.49%	11.82%	11.14%	9.97%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

1991 spending

Capital spending by the electric utility industry in 1991 is projected to reach $26.1 billion. While this reflects a small increase from what was projected for 1990 in last year’s survey, the total will be some 6 percent less than last year’s projections for 1991.

Projected spending for 1991 also will be below actual industry spending in 1990, which totalled $28.6 billion. Actual 1990 spending thus was about 10 percent higher than earlier estimates for the year.

The table at right shows the breakdown in 1991 spending, by function, for each NERC area. As shown, generation spending will total $10.5 billion, up 7 percent from last year’s projected spending. Generation spending in 1991 also will be up from projected *actual* 1990 spending, which totaled $9.7 billion, just $0.1 billion below predicted 1990 generation spending.

Actual spending for generation expansion and upgrading in 1990 was below the $10-billion level for the first time in more than two decades.

Transmission and distribution spending, including substation investment, is projected to total $12.4 billion, which is down about 1.6 percent from last year’s projected spending. Compared with extensions based on actual utility spending in 1990, 1991’s projections indicate a spending level more almost 14 percent less than in 1990.

Other capital spending in 1991, $3.2 billion, would be down 6.55 percent from last year’s estimates of 1991 spending and down 8.0 percent from last year’s projections for 1990. Because *actual* 1990 spending for other classifications of work was $4.5 billion, substantially higher than projected, estimates of other spending in 1991 are down by a huge 27.8 percent from what utilities actually spent last year.

5-year outlook improves

Although the immediate prospect for 1991 is less than projected a year ago, the general outlook for capital investment is favorable for the 5-year period running through 1995. Spending plans for the last year of the period is substantially lower than any of the other four years, which continues the trend of earlier surveys. Many utilities furnishing data for the first four years of the period simply said that they did not have the specifics for 1995 as yet. As a result, projections are much more difficult to make with confidence.

For the first four years of the period, 1991-1994, this year’s study indicates that electric utility spending will total $107.8 billion. Projections of spending for those same years in last year’s report were $101.7 billion. In other words, utilities currently are projected to invest 6 percent more capital for new and upgraded facilities in the 1991-1994 period than they did a year ago.

This compares with a 5.2 percent increase projected a year ago.

For the fifth year of the period, 1995, projections show that the industry plans investment in the range of $24.7 billion. While well under the average for the previous four years, or even the lowest single year, the amount is substantially higher that projections for the fifth year made a year ago. Fifth year spending this year for generation will be almost $1 billion higher and T&D investment will be $2.1 billion higher, while other spending will inch up $104 million. The increases will be 9.8 percent for power supply and 28.6 percent for power delivery.

Spending for generation expansion or upgrading is relatively consistent in the $10.5-plus billion range, except for 1994. That year, generation spending should rise to $12.1 billion as a number of short-term capacity additions are concluded.

On average, generation spending is projected to be $10.9 billion per year during the period. In last year’s 5-year forecast, the average was $10 billion. Thus the industry now can be expected to invest, on average, 9 percent more than indicated a year ago.

This reflects the realization of many utility managements that new capacity must be added if their utilities are to meet growing demand. It is seen as a harbinger of a return to more “normal” times by many. The fact that so much of the capacity to be added is in small, quick-to-add units—gas-fired combustion turbines—is a concern in many quarters, however (see below).

Transmission and distribution spending for the 5-year period is expected to increase to $62,358, a gain of 0.7 percent. Substation spending, which is always understated because many utilities lump substation spending into either transmission or distribution, is projected to total just over $8 billion, up almost $1 billion from last year’s study. Transmission investment will decrease by 0.6 percent, to $15.3 billion. Distribution spending also will fall, by 1.1 percent, to $39.1 billion. Average annual T&D spending at $12.5 billion is less than 1 percent above last year’s projected annual T&D spending levels.

While *EL&P* feels comfortable with the combined power delivery spending figures, it is less so with the individual levels for the three catagories of investment it includes. As pointed out above, substation investment is understated because not all utilities separate such spending. By the same token, both transmission and distribution tend to be overstated because of the same tendency.

Patterns of investment

The 1991 study reflects a significant change in the pattern of spending from a year ago. In the previous study, gener-

PROJECTED 5-YEAR CAPITAL EXPENDITURES
(By NERC Region — in millions of $)

Region	1991	1992	1993	1994	1995	5-Year total
ECAR	$ 3,491	$ 3,322	$ 3,495	$ 3,576	$ 3,451	$ 17,335
ERCOT	2,059	2,125	1,067	1,302	1,441	7,994
MAAC	2,533	2,623	2,904	3,317	3,186	14,564
MAIN	1,871	1,810	1,721	1,687	1,001	8,090
MAPP	766	850	765	792	662	3,836
NPCC	3,028	3,115	3,023	2,806	1,129	13,101
SERC	6,748	7,492	7,973	8,631	7,007	37,851
SPP	1,569	1,531	1,600	1,692	1,999	8,391
WSCC	4,060	4,151	4,046	4,236	4,844	21,336
Total	$26,125	$27,020	$26,594	$28,038	$24,720	$132,497

PROJECTED 5-YEAR CAPITAL EXPENDITURES
(By Function — in millions of $)

Function	1991	1992	1993	1994	1995	5-Year total
Generation	$ 10,487	$ 10,819	$ 10,918	$ 12,142	$ 10,447	$ 54,813
Substation	1,770	1,865	1,584	1,427	1,357	8,003
Transmission	2,900	2,985	3,049	3,162	3,245	15,342
Distribution	7,746	7,976	7,901	8,184	7,206	39,013
Other	3,222	3,373	3,143	3,123	2,464	15,325
Total	$26,125	$27,020	$26,594	$28,038	$24,720	$132,497

ation spending represented less than 40 percent of total capital spending for all except the fifth year of the study, when it rose to 45 percent and again exceeded combined T&D investment. This year, generation's share of capital spending is above 40 percent in each of the five years, averaging 41.4 percent. But generation spending remains in the minority for all five years.

Capacity needs, additions

Seventy-two utilities reported their capacity plans in this year's study. These needs ran through the period after 2000. Of these, 44 (or more than 60 percent) said they had need of new capacity before the end of 1995. About 31 percent will need new capacity between 1996 and 2000. The balance, 25 percent, will not need new capacity until after the beginning of the next century.

Of the 72 utilities who say they will need new capacity, only 50, or 69 percent, reported specific plans for adding new capacity as of the survey time. Thirty-three of the 72, or 46 percent, will add their facilities before the end of 1995.

As concluded last year, the availability of independent power and energy from cogenerators remains a large factor in utility plans to meet system requirements. Participating utilities currently report contracts covering 13,421 MW of independent power producer capacity and 15,559 MW of cogeneration capacity.

Continued on page 25

NEXT CAPACITY NEEDED	
1991	12
1992	4
1993	4
1994	15
1995	9
1996-97	4
1998-2000	9
2000+	15

TYPE CAPACITY TO BE ADDED	
Baseload Steam	7 units
Combustion Turbine	34 units
Hydro	3 units
Combined Cycle	13 units
Other	10 units
Total	67 units

NEXT CAPACITY TO BE ADDED	
1991	3 utilities
1992	6 utilities
1993	4 utilities
1994	7 utilities
1995	13 utilities
1996-97	8 utilities
1998-2000	8 utilities
2000+	1 utilities
Total	50 utilities

FUEL FOR NEXT UNIT	
Gas	47 units
Oil	13 units
Coal	4 units
Other	9 units
Total	73 units

SIZE OF NEXT UNIT	
To 199 MW	44 units
200-299 MW	7 units
300-399 MW	2 units
400-499 MW	2 units
>500 MW	5 units

Regional Capital Spending Projections—1991-1995

ECAR

	Gen	T&D	Other
1991	$ 1,573	$ 1,455	$ 463
1992	1,347	1,541	434
1993	1,627	1,458	410
1994	1,716	1,484	375
1995	1,596	1,576	279
Total	7,859	7,515	1,962

Utilities that make up the **East Central Area Reliability Council** plan capital investment totalling $17.3 billion from 1991 through 1995. This represents a 3.2-percent decrease from the five-year period reported in last year's report. The reduction results primarily from scale-backs of plans in the first two years of the period, compared with last year's forecast. However, considering the magnitude of the predicted increase in last year's projections, the small downward movement represents only fine tuning of spending plans, not any substantive change in programs.

ERCOT

	Gen	T&D	Other
1991	$ 1,200	$ 755	$ 103
1992	1,285	727	113
1993	513	470	84
1994	792	422	88
1995	760	563	119
Total	4,550	2,937	507

Utilities in the **Electric Reliability Council of Texas** will increase their total 1991-1995 capital spending to $8.0 billion, up by 11.7 percent from last year's 5-year projections. Primary increase is in generation, which will climb nearly $1.5 billion, or 47 percent, to $4.5 billion. Power delivery spending will fall by about $195 million, to $2.9 billion. Other spending will decline 45 percent.

ERCOT programs, which we projected to be artificially low in the 1989 forecast, rebounded to normal last year and remain so in this study.

MAAC

	Gen	T&D	Other
1991	$ 1,188	$ 1,103	$ 242
1992	1,225	1,145	253
1993	1,438	1,192	274
1994	1,529	1,400	368
1995	1,383	1,550	253
Total	6,763	6,391	1,410

Mid-Atlantic Area Council utilities will spend more than $14.6 billion for capital improvements and expansion in 1991-1995. The total reflects a 14 percent overall decline in capital investment, from $17 billion projected in last year's study. Generation will increase by $318 million, or 5 percent, but power delivery programs will be cut by $1.5 billion. Other spending also will be slashed by $1.3 billion.

MAAC utilities are primarily committed to small-size combustion turbine additions, mostly under 200 MW, natural-gas and oil based, during the period.

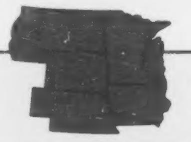
Utilities in the **Mid-America Interpool Network**, comprising utilities in Illinois, Eastern Wisconsin and Northeastern Missouri, will increase investment in generation facilities while cutting back T&D and other improvement programs. Generation spending will increase by 24 percent, to $3.2 billion over the period. Investment in T&D programs will decline by $866 million, 17.8 percent, to $4.1 billion, while other programs will be cut back by 18.8 percent, to $857 million. Generation additions will be largely small gas turbines.

MAIN

	Gen	T&D	Other
1991	$ 724	$ 933	$ 213
1992	698	925	187
1993	647	916	158
1994	665	844	178
1995	491	390	120
Total	3,224	4,008	857

Mid-Continent Area Power Pool utilities will step up their capital expansion and improvement programs across the board in the 1991-1995 time period. Generation spending will climb by 46 percent, to $1.4 billion, while T&D investment will increase 21.4 percent to $1.7 billion. Gas turbines are the choice for capacity additions. Other capital investment will more than double, from $300 million to $780 million. Overall, capital investment during the period will jump $1.2 billion, or 45.9 percent, to $3.8 billion.

MAPP



	Gen	T&D	Other
1991	$ 258	$ 328	$ 180
1992	297	374	179
1993	280	340	145
1994	283	355	154
1995	233	307	122
Total	1,351	1,705	780

U.S. utilities located in the **Northeast Power Coordinating Council**, face tight capacity margins and are increasing capacity-addition plans by 16.7 percent, to $4.0 billion. Confronted with demand growth greater than their own capacity additions, NPPC utilities will become increasingly dependent on non-utility generation and adequate power delivery capacity, yet T&D expansion plans have been cut back by more than $1.1 billion, to $7.3 billion. The 5-year investment projection is about the same as last year's.

NPCC

	Gen	T&D	Other
1991	$ 960	$ 1,661	$ 407
1992	1,015	1,689	41[illegible]
1993	951	1,686	386
1994	785	1,612	409
1995	308	626	193
Total	4,019	7,275	1,807

SERC

	Gen	T&D	Other
1991	$ 3,174	$ 2,615	$ 960
1992	3,606	2,803	1,083
1993	4,126	2,816	1,031
1994	4,910	2,847	874
1995	4,042	2,271	693
Total	19,858	13,352	4,641

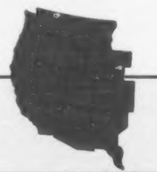
Utilities making up the **Southeast Electric Reliability Council** continue to lead the nation in system expansion and improvement investment and will spend more than one in every four dollars invested in U.S. electric system additions in the 5-year period. SERC utilities will spend $19.9 billion for generation, an increase of 4 percent from last year's projections and 36 percent of all generation spending in the U.S. 1991-1995. Power delivery spending will increase 14.7 percent to $13.4 billion. Other spending will jump a whopping 83 percent, to $4.6 billion.

SPP

	Gen	T&D	Other
1991	$ 231	$ 1,121	$ 216
1992	212	1,078	241
1993	233	1,127	240
1994	316	1,151	226
1995	426	1,310	263
Total	1,419	5,787	1,185

Southwest Power Pool members will decrease generation spending and increase T&D expansion programs 1991-1995. Generation spending will fall 18.5 percent, to $1.4 billion, as SPP utilities seek to reduce their current 30 percent-plus reserve margin. Much of their generation investment will go toward upgrading and improving existing units. T&D investment will climb 29.2 percent, to $5.8 billion. Spending for miscellaneous purposes will more than double, to $1.2 billion.

WSCC



	Gen	T&D	Other
1991	$ 1,180	$ 2,444	$ 437
1992	1,133	2,545	473
1993	1,105	2,527	413
1994	1,145	2,659	432
1995	1,209	3,214	421
Total	5,772	13,389	2,176

Electric utilities comprising the **Western States Coordinating Council** constitute the second largest area of U.S. electric system expansion and improvement. The WSCC utilities will invest more than $21.3 billion for new and upgraded facilities in the 1991-1995 period. This reflects an increase of 1.2 percent. However, both generation and T&D investment will increase solidly. Generation investment will rise almost 36 percent, to $5.8 billion. Power delivery spending will climb 7.3 percent to $13.4 billion.

Energy effiency: new home code, no nukes and abroad

BARRINGTON, IL—Several energy efficiency developments follow.

More efficient homes

The Edison Electric Institute became the first industry sponsor of a new energy efficiency program by the National Association of Home Builders (NAHB). The National Voluntary Environmental and Energy-Efficient Home Program's goal is to cut the amount of energy new U.S. homes use for heating and cooling by half over 1980 levels by 2000.

The program will be administered at the state level to account for climate and building-code differences.

EEI said electric utilities nationwide spend more than $1 billion/year to encourage efficient customer energy use.

In other news, Public Citizen released a statement opposing the administration's anticipated National Energy Strategy and issued a statement called for a 25-30 percent reduction in energy consumption by 2010 and a simultaneous quadrupling of the energy provided by renewable energy resources.

The group, founded by Ralph Nader and claiming support of 70 other citizen-action groups, advocates cutting oil and coal use in half over in 20 years and "accelerating the de facto phase-out of nuclear power."

While Public Citizen admits "some attention is given to energy conservation and renewable energy technologies, the draft [NES] plan proposes only limited government initiatives to promote these options," the group said.

Developing efficiency help

The Global Energy Efficiency Initiative (GEEI) will promote effiency use in developing countries and reduce harm to local and global environments, announced Ronald W. Roskens, administrator or the U.S. Agency for International Development (A.I.D.).

To start GEEI, an ad hoc working group is coordinating a study of energy efficiency possibilities for developing countries and devising a strategy for U.S. assistance. Members of the group include A.I.D. and DOE.

from page 19

Forecast...

Utilities currently planning additions to generation capacity continue to seek small, easy-to-finance...and generally quick-to-get-on-line...units. They reported 44 units currently planned with capacities of less than 200 MW. Eleven units fell in the 200-499 MW range. Only 5 units currently are planned with capacities in excess of 500 MW.

As might be expected from this information, most of the units planned are combustion turbines or combined-cycle units. Forty-seven of the 67 units planned by particpating utilities fall into these catagories. Only seven units will be baseload steam, three hydro and the remaining 10 "other" types of generating units, including windpower.

In terms of fuels for planned units, 47 utilities say natural gas is their choice. Somewhat surprisingly, however, 13 units are planned to burn oil, despite the obvious problems and concerns about its use today. Only four units reported in the survey will burn coal.

Improvement programs noted

A total of 81 plant improvement programs were reported in this year's survey. This reflects a small decrease from last year, when 85 utilities reported such programs. Life extension programs declined by 20 percent, to 24 utilities. Uprating programs also declined, from 16 utilities to 13. The number of utilities reporting modernization programs remained the same at 17. Other programs increased from 22 to 27.

A substantial number of utilities did not report specific improvement programs, but said that they had stepped up their maintenance programs. This may reflect a response to the recent Wisconsin Electric Power decision.

Major disturbances decline

Only one utility reported it had suffered a full-scale blackout last year. This is much lower than reported in last year's study, when eight utilities had been hit with blackouts. The number that encountered rolling brownouts remained about the same as a year earlier, 77 compared with 75 in 1989.

Clean Air Costs
1991-2000 (Billions)

1993	$0.8
1994	$0.8
1995	$1.1
1996	$3.2
1997	$0.4
1998	$3.2
1999	$8.9

Source: estimates of capital expenditures from the Edison Electric Institute

from page 11

Externalities...

This resolution on policy formation was sponsored by Commissioner William A. Badger of Maryland.

- Establish NARUC environmental subcommittees of current standing committees, at the option of those committees. This was a substitution for an attempt to amend the constitution to create a new standing committee. Commissioners argued that such a committee, with two members of each present committee, would not deal with environmental issues any more clearly, but encumber the already difficult task of policy formation from the diverse group.
- Honor the services of retiring commissioners Perry Swisher of Nevada, and Frederick R. Duda, California.

contract. Your utility can shed cost and performance risks, as well as the responsibilities of construction and operation, and still be assured of long-term, cost effective and reliable service.

How Can Your Utility Benefit From Working With Pure Air?

Start where it counts the most—your bottom line. With the Pure Air approach, your utility is free from the capital obligations of financing the FGD project. And stable costs mean reduced rate shock. Clearly, Pure Air gets results that benefit everyone. And remember, the results are guaranteed. 90+% SO_2 removal and availability guarantees for twenty or more years.

These are good reasons to pick up the phone and talk with us. But there are many more. For example, while other FGD systems produce waste by-product, Pure Air's FGD system produces 9000 tons of marketable gypsum each day at 77 plants worldwide. And every ton is sold! So Pure Air can turn a waste management problem into a potential revenue stream.

If you're conducting a compliance evaluation, consider Pure Air. It's right for the natural environment. It's right for the regulatory environment. And it was right for the rate payers of Northern Indiana. See if it's right for you. Call (215) 481-5362. Or write Pure Air, Two Windsor Plaza, Suite 303, Allentown, PA 18195.

Pure Air Is Good For Everyone

Pure Air

Inquire R.S. 11

C6985-6

ELECTRIC LIGHT & POWER

EL&P

FEBRUARY 1991
Volume 69, Number 2
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

WAR on Iraq!

A continuing first strike by U.N. air forces starting Jan. 16 caused a surge, then steep drop in oil prices; financial markets soared. Iraqi power plants and dams may be targeted, after military sites. The **NRC told U.S. nuclear plant operators** to guard against possible terrorism. The **Justice Department urged added security** at all major U.S. facilities. Initially, Iraq struck back at one Saudi oil storage tank. With the U.N. offensive, Bush said the **strategic oil reserve would open** to sales for 30 days. Prior to war, oil prices jumped on speculation. With the world oil glut, summer oil prices might stabilize below $25/bbl.

In other news, (South) **Korea Electric Power** Co. plans to spend $61.2 billion by 2001, in-part for five nuclear units. Canada sells a 700-MW CANDU unit. **Several recent** climatological reports indicate record global temperatures in 1990—March *EL&P*.

Tucson Electric Power faces write-off

Utility reorganizes financing, debts; deadlines, bankruptcy looms

TUCSON, AZ—Tucson Electric Power Co. lost two challenges to regulatory orders that may require a $350-million charge against earnings, pushing the utility further toward seeking bankruptcy protection.

As of Jan. 9, TEP said it was studying if it would appeal, or if it would take the charges together, or in increments over several years.

In other news, the utility obtained an extension on a $70-million credit line from Dec. 31 to the end of January. A TEP spokesman wouldn't speculate on actions if efforts to renegotiate credit failed.

The Dec. 24 court decision came after a drastic Dec. 10 move to suspend all preferred-stock dividends, nearly $10 million per year, to improve cash-flow. The company already had cut pay of senior officers and board members and announced a salary freeze for all other managers. Common stock dividends were eliminated in January 1990, saving $100 million per year.

The utility has been stressed by diversification that didn't work and investments in generating resources.

The state court decision in Phoenix upheld two 1989 orders by state regulators. One concerned a purchased power contract with Century Power Corp., formerly a subsidiary. Regulators allowed recovery of 75 percent of what the contract cost TEP. TEP maintains that regulators based decision-making on current market conditions, rather than

Continued on page 6

Ocean State Power IPP operates commercially

BURRILLVILLE, RI—Ocean State Power (OSP) unit one began commercial operation Dec. 31, 1990. Ground breaking was in January '89.

The $460-million, gas-fired, combined-cycle electric generating plant may be considered the nation's first independent power project. IPPs are expected to provide more than half the industry's new generation over the next 10 years. The 500-MW OSP will also be the first baseload power plant constructed in New England in more than a decade, according to the owners.

The second of two 250-MW units is expected to begin commercial operation this fall.

Two utility holding companies are two of four partners in the project. A creative partnership structure bypasses restrictions in the Public Utility Holding Companies Act of 1935.

Since it produces electricity, and doesn't cogenerate steam, OSP doesn't fit the "qualifying facilities (QF)" guide-

Continued on page 6

Ocean State Power unit 1 begins commercial operation, the first of two 250-MW, gas-fired, combined-cycle units. Among the first large independent power projects, it serves four New England utilities.

***************5-DIGIT 20814
4100127299*0201911 000000 1030
SUITE 800 COPY # 2
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

U.S. energy strategy: White House debates controversial issues

WASHINGTON--President Bush may delay the National Energy Strategy until after the Persian Gulf Crisis is resolved, say some reports. Other NES components could emerge in the Jan. 28 State of the Union Address.

The NES, formed by the Department of Energy over the past 19 months, appears to face debate in the administration among those opposed to policies supporting conservation over free-market initiatives (*EL&P*, Jan., p.4).

Heavy U.S. reliance on oil and related energy policies may explode into the forefront with an Iraq war or military action. As of early Jan. 16, prospects for peace seemed dim. Iraq had not withdrawn from Kuwait, called the United Nation's Jan. 15 deadline ilegal, and continued to prepare for war.

Politically charged issues—such as mandatory conservation measures, oil drilling in environmentally sensitive areas, and promoting renewable energy and nuclear power—may have become points of debate in the final stages of forming NES. These may be future points of argument between the administration and Congress and within Congress.

Conditions named on NU/PSNH deal; UtiliCorp acquires

Mark T. Hoske
News Editor

WASHINGTON—The proposed $2.3-billion merger of Public Service Co. of New Hampshire with Northeast Utilities received several approvals recently.

Both utilities anticipate that PSNH will emerge from three years of bankruptcy reorganization during the first quarter and complete the merger with NU by early summer.

Major outstanding issues—as of mid-January—for PSNH to emerge from bankruptcy were: securing of financing, a decision from the New Hampshire Supreme Court on an appeal of the rate-package approved by state regulators, and a $190-million claim by an unsecured creditor that could give NU the option of pulling out of the deal.

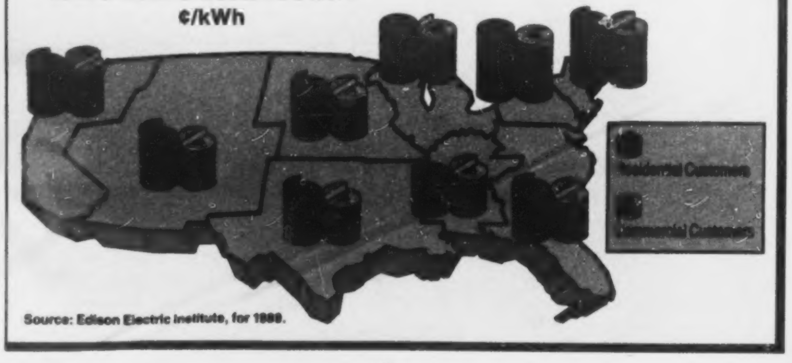
In other merger news, UtiliCorp agreed to purchase Centel Corp.'s Kansas and Colorado electric utilities for $346 million (*EL&P*, Jan., p.1; details below).

SEC approves

The Securities and Exchange Commission unanimously approved the PSNH-NU merger late last December. In a separate and non-binding action, an administrative law judge (ALJ) at the Federal Energy Regulatory Commission approved the merger, with conditions. FERC itself must vote on the proposal. Jan. 9 was the deadline for parties filing comments to the ALJ recommenda-

Continued on page 6

WHO PAYS THE MOST?
¢/kWh



Source: Edison Electric Institute, for 1989.

NEWS BRIEFS

JILL MINNER, Special Projects Editor

WWP buys CP National gas distribution assets

The Washington Water Power Co. (WWP) said it has purchased all of the natural gas distribution assets of CP National Corp., an ALLTEL subsidiary, for $85 million. ALLTEL announced its intention to sell CP National's natural gas distribution systems in September, according to WWP. The properties were acquired by ALLTEL as part of its 1988 acquisition of CP National Corp. WWP, a combination electric and natural gas utility, serves approximately 250,000 electric and 93,000 natural gas customers in eastern Washington and northern Idaho.

VA SCC adopts filing requirements for IPPs

The State Corporation Commission recently adopted filing requirements for independent power producers (IPPs) in Virginia. IPPs must apply to the SCC for a certificate of public convenience and necessity, authorizing construction of facilities. Criteria considered by the SCC includes: need, cost, reliability, and preferred alternatives in rel[illegible] to the utility that would purchase the IPP power.

According to the commission, the adopted standards not only will help determine whether or not to grant a certificate and approve a proposed project, but also will provide IPPs and utilities with an outline of the requisite information that must be included in an IPP certificate request.

New electric service standards proposed

The New York State Public Service Commission has proposed a new set of electric-service reliability and quality standards. Under the proposal, each electric utility would be required to develop programs to identify in detail specific actions to ensure adequate service is provided to consumers. A company's success in implementing those programs would be measured by its ability to meet established "objective" and "minimum" service reliability levels set by the commission. According to the PSC, the service reliability levels are individually designed or "customized" for each utility service territory. The proposed standards, which are pending final approval, are scheduled to go into effect in June 1991.

More customers using natural gas for heating: Idaho Power survey

According to a Residential End-Use Survey conducted by Idaho Power, electricity's share of customer space- and water-heating use is declining. The survey found that 79.2 percent of Idaho Power residential customers use electricity to heat their water and 17.9 percent use gas—a growth of 2.9 percent for gas and a 3.1-percent decline for electricity from 1988. For primary space heating, 41 percent of Idaho Power customers used electricity and 32.5 percent used gas—a 3.8-percent gain for gas and a 1.2-percent drop for electricity since 1988.

Taxes up by $760M for investor-owned utilities in 1989, EEI reports

Federal income tax expenses for investor-owned electric utilities totaled more than $5.28 billion in 1989, a $760-million increase from the previous year, according to the Edison Electric Institute. "The investor-owned electric utility industry continues to be one of the most heavily taxed industries, as well as a major tax collector on behalf of federal, state and local governments," stated EEI President Thomas R. Kuhn.

EEI also said that, according to Internal Revenue Service figures, the average state and local tax rate for investor-owned electric utilities was more than twice the average of all U.S. corporations in 1985.

Seabrook gets high marks in NRC review

In its Systematic Assessment of Licensee Performance report, the Nuclear Regulatory Commission gave New Hampshire Yankee's (NHY) Seabrook Station a "superior" performance rating in two of seven categories. According to operator NHY, the superior ratings were given for emergency preparedness and security and safeguards, while all other areas were given a "good" rating.

The 16-month review covered the plant's preparation for full-power licensing, power ascension testing and initial full-power operation, according to NHY. "The NRC has provided us with a comprehensive assessment of our operations here at Seabrook Station, and has highlighted some items we need to work on. This report will be very helpful for us as we continually strive to improve our performance," said NHY President Ted C. Feigenbaum.

Industry trends, EMF, deregulation discussed at EWRT conference

The Electrical Women's Round Table, Inc. (EWRT) National Conference, held recently in Minneapolis, MN, covered a variety of topics including some issues affecting the electric utility industry.

Ken Wiley, general manager of Florida Electric Power Coordinating Group, described the Electromagnetic Fields issue as the "Acid Rain of the '90s," according to EWRT. Wiley feels that state legislation is needed to regulate magnetic field standards and that electric utilities should request these standards.

Edison Electric Institute's Elizabeth Stipnieks spoke on the deregulation of U.S. utilities. She stressed that a broad, long-range electric strategy, focusing on security, certainty and flexibility, will be needed in the future.

Increasing industry costs, environmental concerns, and the uncertainty of peaking capabilities are some of the major concerns that the electric utility industry will face in the years ahead, according to Northern States Power Co. Chairman and CEO Jim Howard. Howard says the country is in need of a comprehensive energy policy with rate flexibility and a common approach for electric utilities.

Westinghouse, Skoda are partners in global power market

Westinghouse Electric Corp. announced that it will team up with Skoda of Plzen and Prague, Czechoslovakia, for a long-term business and technology association in the global power systems business.

The companies will design, manufacture and construct the next two nuclear units and all fossil-fueled power plants to be built in Czechoslovakia, according to Westinghouse. They will also team in cooperative technology development, engineering and marketing ventures aimed at modernizing and upgrading Czechoslovakia's existing fossil-fueled and nuclear power plants.

"The electrical energy generation products that are engineered and manufactured here are of world-class quality. Skoda, with its 130-year tradition of excellence, has a bright future in the international power systems business, and Westinghouse is pleased to be part of that future," said John B. Yasinsky, Westinghouse executive vice president of power systems.

APS redesigns monthly service statement

Arizona Public Service Co. has redesigned its monthly bill in order to better communicate with and serve customers while controlling costs, according to APS Director of Corporate Relations Scott Jacobson. The new statement is easier to read and provides more helpful and personalized information about the customer's account. "We list various programs and services available from APS," explained Jacobson. APS said many of the bill changes were made as a result of customer comments.

The introduction of the new statement coincided with delivery of the utility's new bill insertion system. "We expect the new machinery to save the company at least $150,000 annually, enabling us to recover the cost in less than three years," Jacobson added.

Starr awarded National Medal of Technology

Chauncey Starr, founding president of the Electric Power Research Institute, recently was awarded the National Medal of Technology by President Bush. According to the American Nuclear Society, Starr was cited for: contributions to energy production and policy, pioneering work in the development of nuclear energy, developing risk assessment and risk management concepts, organizing EPRI, leadership in engineering education and contributions to a technically trained U.S. work force.

The award is given for exceptional contributions to the well-being of the nation through the development or application of technology.

Personnel briefs

Richard E. Disbrow was named president and chief executive officer of **American Electric Power Co. Inc.** He succeeds W.S. White Jr., who will continue as chairman until he retires at the end of 1991.

New England Power Co. has appointed George P. Sasdi president.

Daniel Landguth has been elected chairman, chief executive officer and president of **Black Hills Corp.** He replaces Larry Owen, who retired.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Baltimore Gas & Electric
A $12,500 fine for alleged violations involving security at the Calvert Cliffs nuclear plant.

Commonwealth Edison
A $37,500 fine for a violation of NRC requirements at the Dresden Nuclear Power Station. ComEd was cited for failing to keep the reactor containment adequately sealed against leakage during periodic air sampling of the containment.

Entergy Operations Inc.
A $50,000 fine for alleged violations of NRC requirements at the Arkansas Nuclear One facility. An NRC team determined that, in some circumstances, the ANO control room emergency ventilation system possibly would not have been isolated from the normal plant system if accident conditions made it necessary.

NY Power Authority
A $50,000 fine for the alleged inattentiveness of two NRC-licensed reactor operators on duty in the control room at the Indian Point 3 plant. In addition to fining the NYPA, the NRC issued letters of reprimand to the two operators.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Florida Power & Light teaches nuclear, energy knowledge. 3
Nuclear Regulatory Commission improves with self-assessment. 3
Utilities publicize "green" achievements. 3
Zimmer starts testing, cold snap requires West Coast peak generation. 4
"Outsourcing" offers edge to competitive-minded utilities. 11

T&D TECHNOLOGY

Cable crossing yields benefits but has problems. 16
Meter tester saves OG&E time/money. 16
Sleeve testing aided with new cuff seal. 16
CIPS' mainframe metering/billing system steps up cash flow. 18

GENERATION TECHNOLOGY

Utility fuel of the future may be this liquid-coal mixture. 26
Predictions for nuclear power's future are clouded, but prospects aren't all dark. 27
Navajo Generating Station emissions don't hurt Grand Canyon, says study. 28
End-of-year wrapup for electricity usage shows increases in most areas of U.S. 28

REGULAR FEATURES

Commentary and **Letters** 4
Information/Control Systems 9
Labor/Management Concerns 10
Calendar 12
Financial Performance 14
New Products, New Literature 30, 34
Regulatory Review 36
Management Methods 37

COMMENTARY

There are no shortcuts to success as a world leader

Amid the strident voices of protesters to U.S. initiatives in the Middle East in late January was one that was especially irritating...because while I couldn't agree with the protest's intent, I couldn't deny some of the logic. It was the voice of a young man who latched onto a bit of truth in his simplistic reasoning for why we shouldn't be in Saudi Arabia. He declared that if we would just end our dependence on foreign oil we wouldn't have to send troops to the region.

Actually, he didn't say "end our dependence." He really said stop using so much energy, especially oil, and then war would be unnecessary.

A simplistic argument to be sure. We are in Saudi Arabia for several reasons, a major one of which is the support of an ally, Saudi Arabia, and to liberate Kuwait following Iraq's invasion and rape of that tiny nation.

But *part* of the reason that the U.S. is in Saudi Arabia certainly is oil-related, and not just to satisfy our own immediate needs. The societies of the world are heavily dependent on oil to power their economies. Developing and third world nations need Mideast oil. Japan and many European nations need oil from the Gulf. Oil is too vital a commodity for world economic health to allow its supply to be potentially subject to the whim of the Butcher of Bagdad.

In response to Iraq's actions, the U.S. has acted like the world leader it is by pursuing first a peaceful solution to the problems of the area, then, when peaceful attempts failed, by committing our armed forces to putting an end to the strongarm politics of Saddam Hussein.

We are confident that the U.S. and its allies will prevail. We pray that the conflict will be short and that the loss of life, on both sides, will be small. We hope that the conflict can remain what it is at this writing...a battle to right a grevious wrong and to return the sovereign country of Kuwait to its people, and not become the Holy War Saddam Hussein seeks to make it.

The way of world leadership is neither easy nor cheap. But we cannot escape our responsibilities. We are a world leader. We must lead.

And that returns me to my original concern. The protester was right to a degree. We are dependent on foreign oil to satisfy our still growing energy thirst. Had we learned from the lesson we were exposed to in the mid-'70s, we might be playing a different, and far less costly, role today.

In the late 1970s we had a viable, growing nuclear power industry destined to provide more and more electricity cheaply and safely. We had launched alternative energy programs to develop synthetic fuels. Remember Project Independence...the national development program to cure our foriegn petroleum addiction? We were committed to finding alternate options.

Sure we were! But as soon as the oil spigot was turned on again, and oil prices fell, good intentions evaporated. Congress couldn't wait to start spending designated funds in other areas. Like the farmer who never fixed the hole in his roof because when the sun shone it wasn't necessary, and when it rained it was too wet to go up on the roof, our government killed projects, some very promising, designed to reduce foreign-oil dependence. "Why spend good money to find alternatives when oil is plentiful and cheap again?"

We ran into problems with our nuclear program; politics added months and years to nuclear plant construction schedules and billions to their cost. The Congress stampeded into adopting clean air regulations far beyond rational limits. Our energy options are reduced, and it looks a lot like 1975.

The lesson is there again. Will we remember it after the threat of Saddam Hussein is no more. Will Congress just once make and stick to a decision based on long-term benefits? Can we afford *not* to reactivate the nuclear initiative? Can we afford irrational clean air regulations?

The protestors were wrong in suggesting oil was the only reason we went to war. But it was *one* of the reasons we went to war. And if this nation doesn't do something to end its dependence on foreign oil, we'll face more wars 10, 15 or 20 years from now. The handwriting is on the wall again. Isn't it time that Congress read...and act...upon it? Now is the time to demonstrate our leadership by example, not by words.

—Robert A. Lincicome, EL&P Editor-in-Chief

EL&P

ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice, Publisher
Robert A. Lincicome Editor-in-Chief

PennWell PUBLISHING COMPANY
708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
B. J. Davidson, Assistant Editor
Dianne Wilson, Editorial Assistant-Products/Literature
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402; (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP

Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

Weather-related operations

I read your special report and the related articles in the December issue with a good deal of interest. I am currently involved in the investigation of two major transmission line failures that occurred because the line-design loads were under-specified for the locations.

I think you did the industry a good service by reminding utilities they should stay alert. We have gone through a long period where extreme weather events have not been happening with expected regularity. One of these days Mother Nature and the Gods of Probability are going to collaborate to restore the norm.

The article by Kramer and Castelli did not give any indication as to what Meteorological Evaluation Services Inc. is or does. It sounds like a consulting firm—but I frankly haven't heard of them. The article suggests that information on snow and ice occurrence is available. I would like to communicate with them and find out what is available and how to gain access to it. Could you supply me with an address or a phone or FAX number?

Joe Pohlman
Consultant
Pittsburgh, PA

Ed. Note: For all our readers, here is the requested address: Meteorological Evaluation Services Co., Inc.; 165 Broadway; Amityville, NY 11701; phone (516)691-3395 or FAX (516)691-3550.

Zimmer starts; SMUD conserves with trees; Indiana grid problems feared

BARRINGTON, IL—Utility power supply and demand news follows:

Zimmer begins testing

The Zimmer power plant, expected to begin commercial operation in April, started testing Jan. 1. In January, the 1300-MW coal-fired unit was still $270 million under the $1.3-billion budget. The plant has been converted from a partially built $1.7-billion 800-MW nuclear plant into a coal unit.

American Electric Power Co. managed the first-of-its-kind conversion and owns part of the plant. Other owners are DPL Inc. subsidiary of Dayton Power & Light Co., and Cincinnati Gas and Electric Co.

SMUD evaluating bids, electric vans

The Sacramento Municipal Utility District continues to evaluate 28 non-utility generation capacity proposals representing about 4000 MW. From this, the district will choose 1000 MW of supply to replace various power contracts and another 100-200 MW to support transportation electrification. SMUD is working with a regional transit group on electrification of transportation in the Sacramento area, starting with a test of three electric vans.

The criteria for selecting winning proposals should rely first on environmental factors, according to ratepayer opinions expressed at a public meeting.

SMUD expects that its Conservation Power program and other conservation efforts will "supply" another 1000 MW. As part of that program, 30 energy auditors were hired in the fourth-quarter 1990. A cooperative effort with the Tree Foundation aims to plant a million trees in the region over 10 years; placement can save air conditioning load.

Preliminary results indicate SMUD might have come out $5 million under its 1990 budget, but any benefits could be reduced due to a cold snap requiring purchase of expensive oil-generated power, a spokeswoman said.

RGE gets 1564 MW of intent

Rochester Gas and Electric Corp. said 71 firms submitted 108 notices of intent to bid to provide up to 50 MW of generating capacity and at least 20 MW of conservation and load-management capacity savings.

The supply-side intent totalled 1564 MW, ranging in size from 0.5-50 MW, averaging 31 MW. Natural gas and a small number of projects using coal or waste comprised the majority of fuels. Demand-side bids totalled 176 MW, from 0.1-20 MW, averaging 4 MW. Although the majority of these were commercial and industrial, there was also significant interest from bidders in residential and institutional/government customers, RGE said.

Positive indication

"We are looking for peaking capacity, and the large number of sponsors who are prepared to offer dispatchable resources is a positive indication that the results will benefit the company and its ratepayers," said Paul Ruganis, manager of corporate planning and demand-side management.

Although notices of intent to bid were requested by Nov. 12, '90, RGE said on Dec. 14 that these non-binding expressions of interest still may be submitted and do not commit sponsors to a proposal in March '91.

Safe Allegheny workers

Employees at 13 coal-fired and 10 hydroelectric power stations in the Allegheny Power Sustem completed more than 2-million man-hours on the job without a lost-time injury as of Dec. 1, '90. The last lost-time injury was March 21, '90. A total of 1438 employees in West Virginia, Pennsylvania and Maryland worked to achieve the safety record.

NIPSCO fears reliability trouble

No hearing dates were set as of Jan. 7 for NIPSCO's challenge of FERC's order approving PSI Energy Inc.'s proposal to sell 450 MW at market-based rates and allow open access to the system.

NIPSCO appealed the decision to the U.S. District Court of Appeals for the District of Columbia.

NIPSCO challenged the Federal Energy Regulatory Commission decision saying reliability and quality of service on the NIPSCO system can be compromised by the action, new unnecessary construction could be necessitated and existing wholesale contracts could be impared. The utilities share a border in Indiana and are interconnected.

"Paper" hearing

Further, NIPSCO said, FERC didn't conduct an evidentiary hearing—only a "paper" hearing, and quashed subpoenas seeking engineering evidence as to whether the approved transactions would adversely affect NIPSCO and its customers.

NIPSCO has prepared videotapes explaining its position on reliability and transmission.

Outsourcing: Competitive utility weapon of the '90s

George M. Hill
Worldwide Mng. Partner, Utilities Industry
Andersen Consulting

The push to be more competitive, to satisfy customer needs better and use information to strategic advantage is generating increased interest in "outsourcing" among utilities.

An organization outsources by turning over all of its information technology functions to an outside contractor. For a utility company, this might mean outsourcing the data center and the communications network to a contractor. The contractor manages the day-to-day operations and meets defined objectives, receiving compensation on a contract-services basis.

While the overall concept of outsourcing has been around for years, today's approach is more strategic than functional. In the past, companies outsourced computer operations as a quick fix to lower costs or fill information needs they couldn't handle in-house. Now, while outsourcing still is a cost deflator, companies seek value-added outsourcing partners, not just sellers of computer services—partners who will take equity stakes in relationships and share risks.

Eastman Kodak's decision last year to farm out its entire computer operations to several outside contractors helped authenticate outsourcing as a viable, strategic weapon among major companies. They learned that outsourcing was more than cost-cutting or shipping out information technology (IT) tasks. Kodak chose to outsource to support its corporate strategic goals, by choosing to focus on its core businesses rather than running data centers.

Outsourcing has become a booming industry, valued at almost $5 billion in the U.S., with possible growth to $50 billion by 1994. The Yankee Group, a research organization, predicts that 20 percent of the largest information technology users will outsource some of their information systems in 1991, while the remaining 80 percent will at least consider the subject.

Scenario for a utility

The outsourcing boom hasn't quite reached the utility industry yet. But there is growing interest in the concept. Several months ago, Philadelphia Electric Co. received media attention as a result of pursuing outsourcing as part of a cost-reduction program. A number of other utilities also are investigating or beginning outsourcing programs.

Although the factors driving outsourcing are common across all industry groups, utilities face their own set of considerations.

Many utilities are rethinking their total business missions, due in large part to the fast-changing non-regulatory environment. Deregulation has thrust many energy providers from their safe, controlled and protected environments into a more threatening competitive one. This, and intensified financial pressures have led many utilities to downsize in order to be "lean and mean" for the '90s. They realize the need to be more sensitive and responsive to the needs of their customers and to become market-driven.

Like other industries, utilities also are coming to realize they need to use information more effectively, to link systems and integrate even once-distant operational islands into a unified whole. They know that their entire operation—engineering, construction and operation of power generation, transmission and distribution systems, maintenance, service, sales and customer relations—must share and use information collectively, with faster responses to customer needs and demands.

To be competitive, utilities need to integrate IT into every product and service they produce and offer.

Unfortunately, many utilites are saddled with outmoded computer equipment and cumbersome systems that are not compatible and cannot communicate with each other. These cannot realize the full value of the considerable information they have in-house, or gain from the resource and expertise of a skilled outsourcing provider. In such cases, upgrading and modernization is essential.

Outsourcing guidelines

Utilities are faced with a three-part question: How do I decide if outsourcing makes sense for my utility; if it makes sense, what can I expect from my outsourcing partner; how do I begin?

Companies tend to enter outsourcing relationships with one of five objectives:

1) To manage existing operations while developing new systems. To improve customer service, a utility may need to develeop and implement new systems. An outsourcing provider can maintain day-to-day computer functions, allowing utility MIS personnel to focus on developing new systems.

2) To meet information needs not readily satisfied in-house. Utilities, especially after downsizing, may not have the necessary personnel to handle complex IT requirements. Outsourcing providers can help fill specialized roles.

3) To reduce costs and leverage existing assets. A utility may need to divest some operations to an outsourcing provider in order to reduce costs. The utility benefits by changing fixed costs to variable costs and gaining access to greater resources, research and skilled personnel than it previously had.

4) To capture the market value of existing assets. A utility could sell its systems and software to an outsourcing contractor. The outsourcing partner then would sell services back to the utility and market excess capacity to other clients. The utility has access to up-to-date information, but no longer runs a computer factory, rids itself of aging hardware and gains systems flexibility.

5) To enter an information- and technology-intensive business. Outsourcing can enable the utility to enter new businesses by leveraging off the systems and support functions of its outsourcing partner. The partner may invest cash and/or services in the enterprise for a performance-based return.

Once the decision is made to proceed with outsourcing, a utility's decision-makers need to ask these questions of their outsourcing partner:

√ Do the partner's objectives fit the utility's strategies?
√ Does the partner have the requisite industry experience?
√ Does the partner have the staying power and long-term commitment?
√ Is the partner sensitive to people issues and needs within the organization?
√ Is the partner flexible in entering and exiting business arrangements?
√ Can the partner provide the necessary technology for 21st century solutions?
√ Is the partner objective?
√ Does the outsourcing partner have a track record of managing delivery risk?

New corporate framework needed

Outsourcing is one of the most mission-critical projects a chief information officer will likely undertake. It will require careful planning. The right corporate framework can help support and drive the project. Here are suggestions for this framework.

1) Secure top-level commitment. The project should have solid, unwavering support from the CEO and board of directors. Active leadership from the top will overcome any obstacles and arguments against change from operations managers.

2) Involve key managers, utility-wide. The CEO needs to assemble a core team of operations managers to assess business processes, target areas for change and see them through. These are all part of rethinking how the company works. Teamwork, purpose and commitment is required.

3) Develop a tactical plan. A comprehensive plan that outlines project and management responsibilities, and sets deadlines, must be formed. It should discuss the technology to be used, with appropriate timetables and budgets.

4) Attend to change-based personnel concerns. Outsourcing will improve the operations only to the degree that the program is understood—and supported—by employees. Strategies and management changes should be communicated early on, at all levels of the organization. A regular flow of information and training should follow in order to keep employees motivated and hone their skills.

Outsourcing is not an issue to take lightly. Nor is it for every company. However, marketplace forces make it imperative for all utilities to at least explore outsourcing options and, if appropriate, proceed carefully and wisely.

In an increasingly competitive business environment, outsourcing can cut costs, alleviate headaches and allow for more strategic operations. For many utilities, integrated solutions through outsourcing partnerships can help deliver a competitive advantage—a sure guarantee for corporate survival in the 21st century.

Utilities top record coal use; weather slows recent growth

WASHINGTON—Coal demand and production in 1990, fueled by a greater utility burn, topped 1-billion tons for the first time, according to the National Coal Association. It was the fourth consecutive record year.

Growth in utility coal consumption has slowed due to mild weather, while coal has lost market share as fuel for utility generation since a record 57 percent in 1988. Anticipated 1991 market share is 55.7 percent, NCA said.

NCA attributed the record production, 1.022-billion tons by year-end 1990, to "an increase in utility coal burn, an increase in exports to customers overseas, and to an unusually high demand for coal for utility stockpiles." The forecast for 1990 exceeded 1989 production by 4.2 percent, 41-million tons. Consumption is expected to be 1.002-billion tons.

Year-end 1991 production is expected to decrease slightly, by 1.47 percent, while consumption should increase by 1 percent, NCA said.

Mild weather slows utility growth

Mild weather seems to have contributed to relatively small increases in utility coal use over the past three years, despite setting records, NCA said.

Electric utilities:

- Consumed 766-million tons in 1989, an 8-million-ton, 1.1-percent, increase over 1988.
- Are expected to consume 774-million tons in 1990, an 8-million-ton, 1.0-percent gain over 1989.
- Are expected to consume 787-million tons in 1991, a 13-million-ton, 1.7-percent increase over the 1990 estimate.

The 28-million-ton gains during the years 1988-91, pale compared to the 64-million-ton increase 1985-87.

NCA reports that coal consumption increased at a slower rate than electricity generation, falling from a record 57-percent share in 1988, to 55.9 percent in 1989, and an anticipated 55.1 percent by year-end 1990. NCA said 1991 share of market would climb to 55.7 percent (see table).

Electric Utility Generation Source, Growth

	1988	1989	1990[1]	1991[2]
Coal	57.0	55.9	55.1	55.7
Oil/Gas	14.8	15.2	13.2	12.9
Nuclear	19.5	19.0	20.9	20.9
Hydro/Other	8.7	9.9	10.8	10.5
Electricity Growth Rate	5.1	2.8	2.8	0.4
GNP Growth Rate	4.5	2.5	1.0	0.5
Coal Consumption (million tons)	758	766	774	786

1) Estimate
2) Forecast

Source: National Coal Association

Penelec reduces staff by 300

JOHNSTOWN, PA—Pennsylvania Electric Co. is reducing staff by 300 employees by the end of April. Eight percent of the 3800 workforce, union and non-union employees, are affected.

Downsizing

"Similar downsizing is occurring throughout the industry and in other businesses," said Penelec President Robert L. Wise. Penelec is a General Public Utilities Corp. subsidiary.

Penelec will offer eligible non-union employees a voluntary enhanced retirement program, adding three years of age and service to those elegible for retirement as of March 31.

Wise said that Penelec also would discuss company retirement incentives with various union representives.

Some restructuring, relocation

"The voluntary retirement program results will be used to determine how many remaining positions need to be eliminated," Wise said. Some restructuring and relocation of employees would also be necessary.

Another GPU company, Metropolitan Edison Co., is also offering voluntary retirement to non-union employees.

Previous cuts

Since 1986, Penelec has reduced its total workforce by more than 500 positions, the majority, non-union, through restructuring, reassignment, attrition and voluntary separation.

New study refutes Navajo effects at Grand Canyon

BARRINGTON, IL— A Salt River Project-funded study completed recently indicates that the Navajo Generating Station (NGS) has *not* been the main culprit in reducing visibility at Grand Canyon National Park. The report is the latest development in the continuing saga of visibility problems at the national park.

Preliminary conclusions from the work, whose analysis and modeling still are in-process, suggest:

- Worst visibilities occurred in the Canyon when NGS emittants were not in the vicinity and when hazy air was coming into the region from the southwest (NGS is east of the Canyon).
- Light-scattering values at the Canyon were no greater when NGS emittants were present than when absent.
- Using tracers alone was inadequate for determining the contribution of individual sources to regional haze.
- Weather conditions that accompanied reduced-visibility episodes during 1990 were similar to conditions that occurred during the previous study—Winter Haze Intensive Tracer Experiment (WHITEX)—and were representative of winters in the Grand Canyon.

Another observation was that long-range transport of pollutants from outside the study area was a substantial source of visibility impairment on several occasions.

Consequently, Salt River Project issued a statement that "Preliminary observations from an extensive study last winter show that control of sulfur-dioxide emissions from Navajo Generating Station would not produce, on average, any significant visibility improvements at the Grand Canyon".

Dr. Prem Bhardwaja, an SRP expert on air quality and visibility and head of the study, stated that the station contributed to impaired visibility only 4-7 percent of the time, including evenings.

He also reported that a team of experts is working on an in-depth analysis "to see how much improvement in visibility would occur if NGS emissions were reduced. These results will be based upon state-of-the-art technology known as 'deterministic modeling'."

Bhardwaja added, "As soon as this report is prepared, it will be reviewed by a team of experts outside of SRP's study team. Results of this peer review will be incorporated in the final report."

The Environmental Protection Agency identified NGS as a major contributor to visibility impairment at the Grand Canyon in 1989, based on the National Park Service's WHITEX experiment. SRP pointed out perceived weaknesses in data reduction and associated conclusions of the WHITEX report to the EPA.

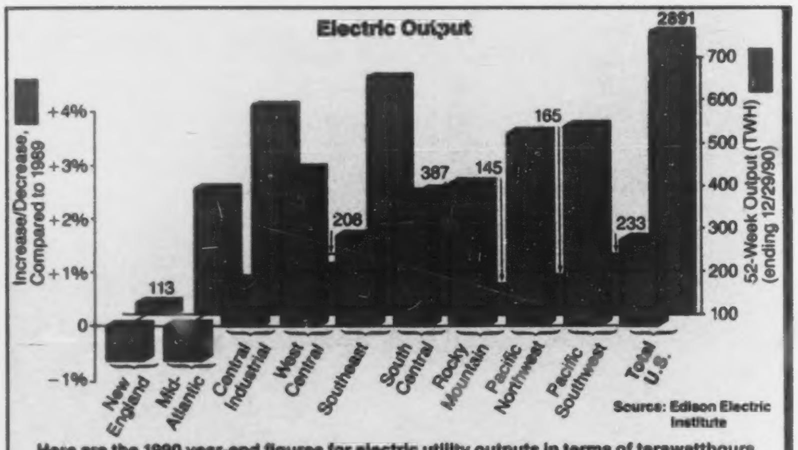
The Dept. of the Interior also was concerned about the WHITEX results and asked the National Academy of Sciences to review the report for scientific accuracy. The National Research Council, an arm of the Academy, issued a report that said NGS was one source of the visibility problem at the Canyon, but concluded the experiment could not reliably determine the amount of the plant's contribution.

The WHITEX report was issued on Dec. 4, 1989. Testing was conducted during January and February of 1987. Its participants concluded that NGS "is the largest single point source of SO_2 emissions in the vicinity of Grand Canyon National Park."

An aerosol tracer was utilized to track the power plant's emissions at one point in the Grand Canyon.

More sites, more data

This newest Salt River study was performed by 100 scientists and technicians from 11 organizations who gathered air-quality samples and meteorological data from 26 sites in and around the Canyon over an 81-day period from Jan. 10 through March 31, 1990.



Source: Edison Electric Institute

Here are the 1990 year-end figures for electric utility outputs in terms of terawatthours and compared to the same 52-week period of 1989.

EDF opens office in Washington

WASHINGTON—Electricité de France International has opened a North American office in Washington. EDF officials hope to establish contacts with U.S. and Canadian energy representatives in private utilities and regulatory bodies, exchange information, and create new joint strategies for developing energy resources and protecting the environment.

EDF has been building an exchange program with U.S. energy organizations for several years, which has resulted in 10 representatives located around the U.S. in various positions who are learning about the energy situation in this country and lending their expertise where appropriate. The French national utility also has entered into joint ventures with two U.S. companies, Computer Assisted Trading Co. and Fuel International Trading Co.

Analyzing boiler failures

NAPERVILLE, IL—This field guide of proven methods for identifying boiler failure problems also outlines necessary corrective steps.

Failures occurring in nearly all locations, as well as some preboiler and afterboiler regions, are discussed.

The Nalco Guide to Boiler Failure Analysis, by Robert Port and Harvey Herro, 296 pages, hardcover, $39.95.

Order from Nalco Chemical Co., Attn: Marketing Communications Dept., One Nalco Center, Naperville, IL 60563. Make check payable to McGraw-Hill Book Co.

In the dark about conserving electricity?

Let the E-MON D-MON
Energy MONitor
Demand MONitor
show you the light!

actual size
4½" x 6"

A DIGITAL SUBMETER OF KILOWATT HOURS

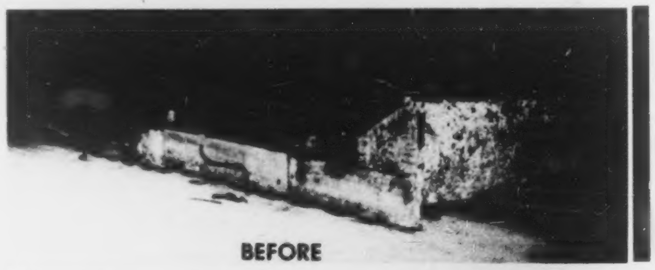
- certified to ANSI C 12.1 accuracy standards by recognized independent testing laboratory
- a low cost, quality installation for offices, apartments, plants, malls, building intelligence systems, ballpark and airport concessions
- installs in minutes without interrupting power
- accommodates most voltages and currents
- demand and other options available

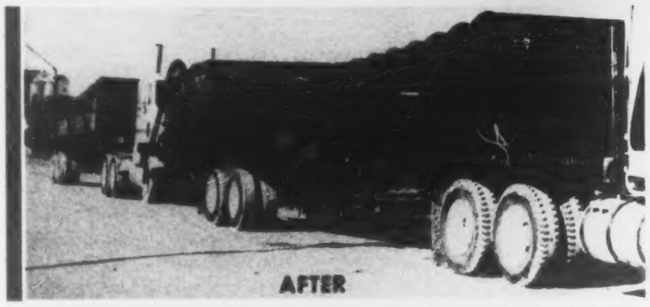
MADE IN USA

For your local distributor or representative, contact:

E-MON® Corp.
P.O. Box 245
Skillman, NJ 08558
800-334-3666
in N.J.: 609-466-0068
FAX 609-466-0342

Inquire R.S. 15


BEFORE


AFTER

Add New Service Life To Any Intake Screen At Any Time... At Your Place Or Ours.

Your aging traveling water screen can be better than it ever was. It can have greater reliability, more on-line availability, even a longer service life . . . if Envirex retrofits or rebuilds it.

That's because the components, materials and techniques we use today are substantially upgraded over those used when your screen was new. In fact, in most cases, your renovated screen will perform better than when it was new.

Our experienced service people can work at your site; or we can remove the screen entirely and take it to one of our factory centers for reconditioning.

We can rehabilitate all major brands including Rex, Royce and Link-Belt screens. In every case, you can expect exact alignment of operating components for extended life, finished replacement parts made to OEM specs or better, and materials selected for toughness and dependability.

Envirex. Since 1891 we've been your proven partner under the Rex trademark. Today we **add up** as your single source for every traveling water screen need. For details, call Roy Cheesman, General Manager,
Traveling Water Screen Products, Envirex,
1901 S. Prairie Ave., Waukesha, WI 53186.
Phone: 414/547-0141. Fax: 414/547-4120.

Envirex

Inquire R.S. 16

C6985-6A

ELECTRIC LIGHT & POWER

EL&P

MARCH 1991
Volume 69, Number 3
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

50-minute delay reported in Japan nuclear accident

Emergency cooling, small radiation escape; valve sticks; another industry PR problem?

Mark T. Hoske
News Editor

WASHINGTON—The Kansai Electric Power Co.'s 500-MW Mihama Unit 2 underwent emergency core cooling (ECC) on Feb. 9, 50 minutes after initial signs of a malfunction.

It was Japan's first ECC. After ECC started, a power-operated relief valve stuck closed. An auxiliary system operated, however. The malfunction is under investigation. Japanese policy changes resulted (see Late News).

The incident caused no injuries, but released a small amount of radiation (0.134 curies), about 8 percent of annual plant emissions allowed.

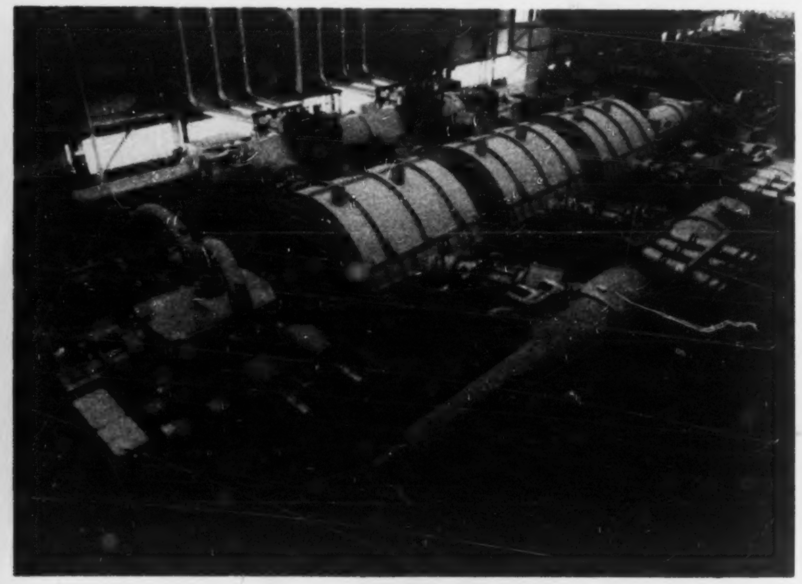
The primary cause of the mishap at the 19-year-old pressurized-water reactor was thought to be fractures in primary steam tubes. Operators did a 40-minute radiochemical test on the secondary side, as plant procedures required, to verify the leak shown by a monitor. If the plant had been shut down immediately, emergency cooling might have been avoided.

The danger now is political for Japan's nuclear program, which has been slated to supply 36 percent of the country's electricity by '95, up from about 25.5 percent in '90, to cut imported-oil dependence. Japan operates 41 nuclear plants; 10 are under construction. Also, the world nuclear industry has a public-relations challenge. Despite an impressive safety record, two far worse accidents—Three Mile Island in '79, and Chernobyl in '86—have slowed some nuclear plant construction.

Final details are pending the investigation, but the sequence of events, as confirmed by Kansai Electric's Washington office, was as follows: Primary, radioactive water leaked into the secondary water system, which drives the turbines. One gauge showed the radiation increase; operators analyzed secondary side water to verify the leak. Radiation levels rose; the leak was verified; operators moved to shut down the plant 48 minutes after initial detection. Core water pressure fell; temperature rose, causing automatic reactor shutdown and core flooding 2 minutes later.

Japan's Mitsubishi Heavy Industries built the plant, based on a Westinghouse Corp. design. A Westinghouse spokesman said preliminary data showed "the plant response was well within the design basis for this event."

Ontario Hydro starts nuclear unit



Turbine rooms at Darlington Nuclear Generating Station still need work as the utility prepares units 3 and 4 for operation in 1992-93. Unit 1 began operation recently, but Unit 2 was halted. See story p.3.

******************5-DIGIT 20814
4100127302*0301911 000000 1446
SUITE 800 COPY # 1
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

LATE NEWS

The National Energy Strategy, finally released on Feb. 20, focuses on energy supply—supporting nuclear power, offshore drilling, alternate fuels, and market initiatives to increase competition and promote efficiency. It would boost renewables, but add no energy taxes. A Feb. 5 Senate plan also would open now-protected Arctic areas, but use revenue for conservation/R&D. Debate intensifies.

Mihama's mishap—level 3 on Japan's scale of eight—led to change in Japanese nuclear guidelines, now requiring immediate shutdown for abnormal radiation hikes of 20% or more (like Mihama). U.S. plant specifications already call for shutdown in such a case. One tube failed at Mihama and 20 tons of water leaked to the secondary. See also April *EL&P*.

NES funds climb in '92 U.S. budget

WASHINGTON—The administration's 1992 fiscal year budget includes increases for programs related to the National Energy Strategy, huge hikes to administer Clean Air Act amendments, and expansion of programs related to global climate change.

DOE fossil R&D funding falls. Nuclear Regulatory Commission user fees would increase to 100 percent from

Continued on page 7

Possible child-cancer link to appliance use is found

PALO ALTO, CA—Preliminary data from an EMF/cancer study sponsored by the Electric Power Research Institute shows:

- Considerable support for a relationship between children's use of electrical appliance and leukemia risk.
- Some support for a relationship between household wiring configuration and leukemia risk.
- "Little support for the relationship between measured magnetic field exposure and leukemia risk.
- No support for a relationship between measured electric field exposure and leukemia risk."

A statement from the Electric Power Research Institute said, "EPRI views these findings as important, but the lack of a clear pattern of association with different measures of exposure requires further research."

An *EL&P* special report on EMF issues starts on page 8.

"The reason(s) why wiring configuration correlates with leukemia risk better than measured exposure are not clear," according to a statement from John Peters, University of Southern California, who conducted the study.

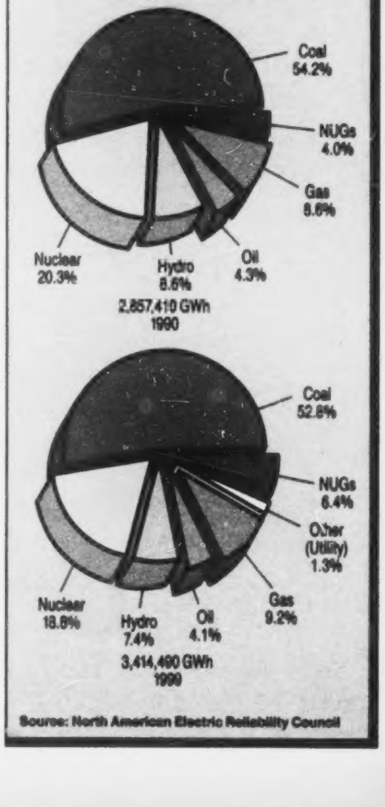
USC investigators have decided that full public discussion of the results should await publication of their paper in peer-reviewed literature. Findings here are preliminary.

The results may be biased, researchers stated, because results rely in-part on parents' recall.

The statement continued, "It is also not clear whether short-term, very high exposure of children to magnetic (or electric) fields from electric appliances are responsible for the observed risk or whether associated exposures are responsible. These latter two issues de-

Continued on page 7

U.S. ELECTRICAL ENERGY PRODUCTION BY FUEL



Source: North American Electric Reliability Council

NEWS BRIEFS

JILL MINNER, Special Projects Editor

Idaho Power will not push for Kanaka license

Idaho Power said it will not ask the Federal Energy Regulatory Commission to reconsider its decision to reject the utility's license application for a 17-MW hydroelectric project at Kanaka Rapids on the Snake River.

"The high cost of the project and environmental concerns led the company's senior management to decide against pressing the issue at this time," explained Jan Packwood, vice president of power supply for Idaho Power.

The utility said it submitted its application after L.B. Industries of Boise applied to FERC for a preliminary permit to build a hydroelectric facility at Kanaka Rapids. "We felt compelled by the competitive situation and the need to evaluate new resources for our growing number of customers to submit an application that we knew might face difficulty," stated Packwood.

According to FERC, the utility's application was rejected because it was deficient. The commission said Idaho Power did not follow the normal process nor perform the required studies and did not properly inform state and federal agencies of its intentions.

Foreign regulators invited to join NARUC

The National Association of Regulatory Utility Commissioners said it has adopted a resolution inviting foreign agencies engaged in the regulation of public utilities and carriers to join NARUC as associate members. The resolution, sponsored by Patricia M. Worthy, was adopted at NARUC's 102nd annual convention in Orlando, FL.

Personnel briefs

E.R."Dick" Brooks has been appointed chairman and chief executive officer of **Central and South West Corp.** Brooks, who will continue to serve as president of the company, succeeds Merle L. Borchelt who retired February 1.

E.R "Dick" Brooks

Southwestern Public Service Co. President and CEO Bill D. Helton has been named chairman of the board. He replaces W.R. "Bill" Esler who retired March 1.

Illinois Commerce Commission Deputy Executive Director Madelon A. Kuchera was chosen to serve as acting executive director until the commission fills the position.

Robert O. Bigelow, vice president of **New England Electric System**, was elected chairman of the **New England Power Pool** (NEPOOL) Executive Committee. George W. Edwards Jr., chairman and CEO of **The United Illuminating Co.**, was named chairman of NEPOOL's management committee.

The **American Society of Mechanical Engineers** has appointed Nathan H. Hurt Jr. as president. He will take office in June 1991.

J.E."Jack" Katlic, senior vice president at **American Electric Power Service Corp.**, succeeds the retiring Wayne T. Ewing as chairman of the **National Coal Association**.

Western Union service aids utility customers paying bills in person

For utility customers that want to pay their bills in person, Western Union Financial Services Inc. now offers an electronic bill paying service in many parts of the country. The Easy Pay service enables consumers to pay their bills in cash at supermarkets and other convenient locations.

According to Western Union, a terminal in each agent location processes payments and issues customer receipts. The receipt has a confirmation code that late-payers can immediately call into their utilities to prevent cut-off in service for non-payment. The funds are transferred electronically by Western Union to the utilities' collection accounts.

WE reorganizes to improve customer service

Wisconsin Electric Power Co.'s new customer operations department will help improve customer service, according to the utility. "We reviewed our field operations and customer relations to find ways to be more responsive and, at the same time, develop a streamlined, more efficient organization," explained WE Chairman and CEO Richard A. Abdoo. The new department, which replaces WE's division operations department, is made up of seven regions. Each region has its own managers for sales, service, engineering and operations, according to WE.

Residential electricity cost more in '89/'90 winter: NARUC survey

Twelve Most Expensive Companies

Company Name	State	Avg. Cost Cents/kWh	Winter 1989-90 National Rank
Long Island Lighting Co.	New York	$0.143	1
Nantucket Electric Company	Massachusetts	$0.142	2
Kauai Electric Co.	Hawaii	$0.141	3
Philadelphia Electric Co.	Pennsylvania	$0.135	4
Consolidated Edison Co. of N.Y.	New York	$0.134	5
Hawaii Electric Light Co.	Hawaii	$0.125	6
Orange & Rockland Utilities, Inc.	New York	$0.123	7
Commonwealth Electric Co.	Massachusetts	$0.120	8
Maui Electric Co.	Hawaii	$0.119	9
Duquesne Light Co.	Pennsylvania	$0.117	10
Toledo Edison	Ohio	$0.116	11
Ohio Edison	Ohio	$0.114	12

Twelve Least Expensive Companies

Company Name	State	Avg. Cost Cents/kWh	Winter 1989-90 National Rank
Washington Water Power Co.	Idaho	$0.042	187
Washington Water Power Co.	Washington	$0.043	186
Pacific Power & Light Company	Washington	$0.043	185
Idaho Power Co.	Idaho	$0.047	184
Idaho Power Co.	Oregon	$0.047	183
Portland General Elec. Co.	Oregon	$0.048	182
Potomac Electric Power Co.	Dist. of Col.	$0.049	181
Kentucky Utilities Co.	Kentucky	$0.051	180
Puget Sound Power & Light Co.	Washington	$0.053	179
Minnesota Power & Light Co.	Minnesota	$0.053	178
Nevada Power	Nevada	$0.053	177
Kingsport Power Company	Tennessee	$0.054	176

Source: National Association of Regulatory Utility Commissioners

Residential customers' electric bills last winter cost an average of 8.3 cents per kWh, up from the previous winter's average of 8.07 cents per kWh, according to the National Association of Regulatory Utility Commissioners.

In its nationwide survey of 1989-90 residential winter electric bills, NARUC reports that Washington Water Power Co. customers in Lewiston, ID pay the least for their winter electricity—approximately 4.2 cents per kWh. Long Island Lighting Co. customers in Long Beach, NY are in the most expensive territory, paying 14.3 cents per kWh, according to the association (see tables).

In a comparison of regions, the survey found that the Northeast and Pacific regions were the most expensive, while the Northwest and Rocky Mountain regions were least expensive. A total of 187 service territories were surveyed for December, January and February, covering four energy consumption levels—250, 500, 750 and 1000 kWh.

A copy of the 216-page survey may be obtained for $20 from NARUC, P.O. Box 684, Washington, DC 20044.

State outdoor lighting contest entries sought

Entries are now being taken for Florida's annual outdoor lighting competition, Night Beautiful, which recognizes the creative use of energy efficient outdoor lighting. Entries are judged on technical achievement, enhancement of architectural lines, energy efficiency and impact on the nighttime environment.

Sponsors of the statewide competition include: Florida Power Corp., Florida Power & Light Co., Orlando Utilities Commission, Tampa Electric Co. and the Illuminating Engineering Society. Also sponsoring the event are General Electric Lighting Systems, Sylvania, the Florida Department of Commerce and GTE.

The deadline for entries is March 29, 1991. For more information contact Beth Walters at EventMakers Corp. (813) 223-4141.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Southern California Edison Co.

A $150,000 fine for alleged violations of NRC requirements involving the operability of safety-related systems at Units 2 and 3 of the San Onofre Nuclear Generating Station. On two separate occasions, valves in standby safety systems were temporarily misaligned, according to the utility.

Tennessee Valley Authority

A $30,000 fine for failure to comply with overtime requirements and for inadequate management control of overtime work during the last refueling outage at Unit 2 of the Sequoyah nuclear power plant.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Ontario Hydro advances Darlington projects. 3
Clean air compliance: utilities compile costs. 4
Seabrook license upheld/Shoreham update. 7
Special Report/EMF analysis: Hazard or hype? 8
NERC outlines regional transmission additions. 12
Focus Report: Demand side management market expands. 13

GENERATION TECHNOLOGY

Alabama Power added new unit ahead of schedule, made 1000 change requests. 17
Seattle couldn't find a contractor, so overhauled a turbine with inhouse talent. 17
Environmental cleanup time arrived; here are main methods for complying. 19
Heat pumps using dual fuels save operating costs; **install pumps** more cheaply 22

T&D TECHNOLOGY

DA/DSM symposium draws 400 top level engineers. 24
PCB forum focuses on technology and regulation. 26
Outage calls are reduced with interactive voice and data technology. 27
Energy thieves get caught at PG&E. 28
Distribution costs to be minimized by PacifiCorp program. 28

REGULAR FEATURES

Commentary 4
Labor/Management Concerns 6
Calendar 11
Information/Control Systems 23
Bulletin Board 29
Readers' Service 38A
New Products 40
Regulatory Review 43
Management Methods 44

COMMENTARY

Can customers be forced to pay for charity, good works?

Am I my brother's keeper? Must I pay more so someone else can pay less? Can my utility make me pay for programs to help it attract business? These are just a few of the questions that litigation ultimately may resolve for Illinois residents. It began as a telephone issue, but its implications are far broader. If the decision stands further review, utilities in other states could face problems, too.

The initial legal issue is a simple one. The Illinois Appellate Court already has ruled, in *Shortino vs. Illinois Bell Telephone Co.*, that the utility cannot charge its *billed* customers in Chicago to make up for a city message tax that it does not collect from pay-phone customers. It says one group of customers cannot be made to pay the tax that should have been paid by another group.

The decision is being extended. Already, Illinois phone customers are up in arms over an extra 15 cents per month in charges to pay for phone service to the poor.

Residential and commercial customers of Illinois Power Co. pay higher rates to make up for economic development allowances and incentive rates granted to industrial customers to relocate to or remain in IP's territory instead of moving to some other utility area where electric rates are lower.

Commonwealth Edison Co. collects a premium from customers outside the city of Chicago to pay for its Chicago franchise tax. Illinois Bell does the same. CECo also has requested it be allowed to include the cost of its $21-million annual economic development program in residential and small business rates.

For years all Illinois utilities have been major contributors of funds, personnel and services to local and regional charities, educational and cultural activities. They have tried to be good corporate citizens, using shareholder funds for worthwhile activities. They have sought to make customers partners in support of such causes through rate adjustments, a practice endorsed by their state commission. The Shortino ruling could end many of these programs.

For some unknown reason, consumer advocates see electric and other utilities as totally public entities. While they would not criticize, much less try to stop, charitable contributions by supermarket chains, petroleum companies or department stores—knowing well that customers pay for such costs in products and services—they gleefully challenge utilities providing similar support.

In their efforts to protect utility customers, consumer advocate groups chance the possibility of penalizing many of its most needy members. They would throw the baby out with the bath water, so to speak.

At issue is a matter of principle. It is also a matter of money, and what's best for the common good. It would be a shame if consumer advocates contribute to the detriment of the very people they profess to protect, but it could happen.

Birthday of an old friend

Reddy Kilowatt, longtime symbol of service and reliability for the investor-owned electric utility industry, is celebrating a milestone birthday. Hard to believe, but the little guy is now 65...and still going strong.

Reddy came to life in 1926, the product of the imagination of Ashton B. Collins, a commercial manager for Alabama Power Co., looking for a way to symbolize the many things that electricity could do. In his youth, Reddy helped utility companies sell appliances and build load. As he moved into early adulthood, he helped promote electrical safety, educate children and promote energy awareness.

Now, at an age when many of us are looking forward to retirement and the rewards of a productive lifetime, Reddy is busier than ever, still representing electric utility companies with its customers and with young people. He's helping find electrical solutions to environmental problems, promoting conservation and use of energy efficient appliances and equipment. In schools today, he's proudly serving as mascot for the "Just Say No to Drugs" campaign. Just like the energy he personifies, Reddy continues to seek new ways to serve humanity, to help make the world a better place in which to live. We should all do so well!

Robert A. Lincicome, Editor-in-Chief

EL&P
ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice, Publisher
Robert A. Lincicome Editor-in-Chief

PennWell PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
B. J. Davidson, Assistant Editor
Dianne Wilson, Editorial Assistant-Products/Literature
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Canterella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402, (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101

BPA ABP Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

Update: Utilities report projects to comply with clean-air rules

Utilities are beginning to announce compliance strategies for meeting the acid rain section of the Clean Air Act amendments.

The 110 plants named in the legislation—representing 89,545 MW of power production capacity—must comply with restrictions in Title IV by Jan. 1, 1995, unless they qualify for an extension. Other plants also may require new controls, depending on output during the baseline years of the new law.

Of the 110 plants, 11 (less than 4 percent of generating capacity) currently use natural gas as an alternate fuel, according to "Natural Gas Trends, 1991," by Arthur Andersen and Cambridge Energy Research Associates. The report suggests that many of the targeted plants could meet new standards by cofiring natural gas with coal.

Utilities' choices of pollution-control solutions depend on many factors including plant age, location, capacity, fuel purchase/transportation contracts, and a variety of utility strategic issues.

Atlantic Energy

Atlantic City Electric Co.'s wholly-owned B.L. England Station and its jointly owned Conemaught Generating Station in Pennsylvania have been specifically named in the legislation for sulfur dioxide reductions by 1995. Additional compliance measures will be needed for the 2000 deadline.

The company said preliminary revenue requirements could be increased by less than 5 percent to comply ($36.2 million, based on operating revenue for 12 months ending November 1990 of $723.9 million). ACE would seek to recover the costs through future regulatory filings.

Potomac Edison

Potomac Edison, and parent company Allegheny Power System, developed a preliminary plan subject to revision and approvals. The plan includes retrofitting two power stations with flue gas desulfurization systems by 2000 for about $450 million. Fuel switching and burning lower sulfur coals is also being investigated.

United Engineers and Constructors, John T. Boyd Co. and Stone & Webster Engineering Corp. are providing studies, engineering and design services for the scrubber installation.

Three 640-MW units at the Allegheny Power's Harrison Power Station, near Shinnston, WV, would need the scrubbers to meet the 1995 Phase I deadline. Compliance costs would be about $800 million; Potomac Edison's share would be about $250 million.

Scrubbers or fuel switching or a combination are being considered for Hatfield's Ferry Power Station near Mason-Town, PA, and other power stations. This Phase II work (deadline 2000) would cost about $950 million for Allegheny Power, including $190 million for Potomac Edison.

Other efforts

Other utilities' efforts include:

- Basin Electric Power Cooperative, Bismarck, ND, established a taskforce working on a stack emissions monitoring system to meet mandatory requirements for continuous surveillance.

Laramie River Station Unit 3, at Wheatland, WY, is being used for a prototype installation for 100 percent availability and accountability by the end of 1994.

- Commonwealth Edison Co. is still studying alternatives for Kincaid Units 1 and 2, which burn high-sulfur Illinois coal. The $4.95-billion, 1991-95 construction program contains no expenditures for clean-air compliance.
- Montana Power Co. reports no major impacts. The Corette Plant, at Billings, will meet new standards through careful fuel blending. Meeting nitrogen oxide emissions in 1995 will require minor modifications on three plants at an estimated total cost of $10-20 million, placing Montana Power's additional costs for compliance among the lowest in the nation, the company said.
- Potomac Electric Power Co., in a Jan. 24 financial statement, listed Clean Air Act expenditures in millions of dollars at 10, 110, 60, and 10, for the years 1992-95. In 1993, that represents 28 percent of total company construction expenditures in 1993, but only 14.5 percent from 1992-95. The amounts exclude AFUDC.
- In part of a Jan. 29 statement, United Illuminating said "UI expects to be in a position to sell Clean Air Act 'allowances,'" citing a diversified fuel mix and desire to "compete aggressively for wholesale sales."

Targeted plants, Clean Air 1990

State	Number of Targeted Plants	Generation Capacity
Alabama	2	3,363
Florida	2	2,771
Georgia	5	8,444
Iowa	6	977
Illinois	8	6,002
Indiana	15	11,275
Kansas	1	158
Kentucky	10	4,649
Maryland	3	2,390
Michigan	1	650
Minnesota	1	163
Missouri	8	6,547
Mississippi	1	780
New Hampshire	1	459
New Jersey	1	299
New York	5	2,408
Ohio	15	14,131
Pennsylvania	9	7,675
Tennessee	4	6,331
Wisconsin	6	2,740
West Virginia	6	7,363
TOTAL TARGETED CAPACITY		89,545 MW

Source: Arthur Andersen, Cambridge Energy Research Associates

B&W acquires facility for boilers

BARBERTON, OH—Babcock & Wilcox agreed to purchase a facility in Little Rock, AK, to produce steam-injection boilers, heat-recovery steam generators, package boilers and boiler replacement components. The $4-million price included about 187,000 ft^2 of building space, overhead cranes, office equipment and site services.

B&W plans to invest another $6 million in the business, which will be operated by a separately incorporated subsidiary called Babcock & Wilcox-ST Co. Boiler technology from B&W and certain technologies purchased from Struthers Thermo-Flood will be used.

The facility, owned by ARKLA Inc., was built in 1982 to produce large gas compressors, but was closed in 1987.

Initially 150 will be employed, with up to 350 within two years in engineering, manufacturing, marketing and project management. B&W Power Generation Group is located in Barberton, OH, with U.S. manufacturing plants in Paris, TX, and West Point, MS.

B&W is a major operating unit of McDermott International Inc., a leading worldwide energy services firm.

Southwest faces highest transmission growth in 90s

WASHINGTON—U.S. transmission additions are expected to total 13,353 circuit miles over the 1990-99 period, a 9.1-percent gain, for a total of 159,950 circuit miles.

Canadian projects will add 9366 circuit miles, or 23.5-percent, to the high voltage transmission system, totalling 159,950 miles at the end of the period.

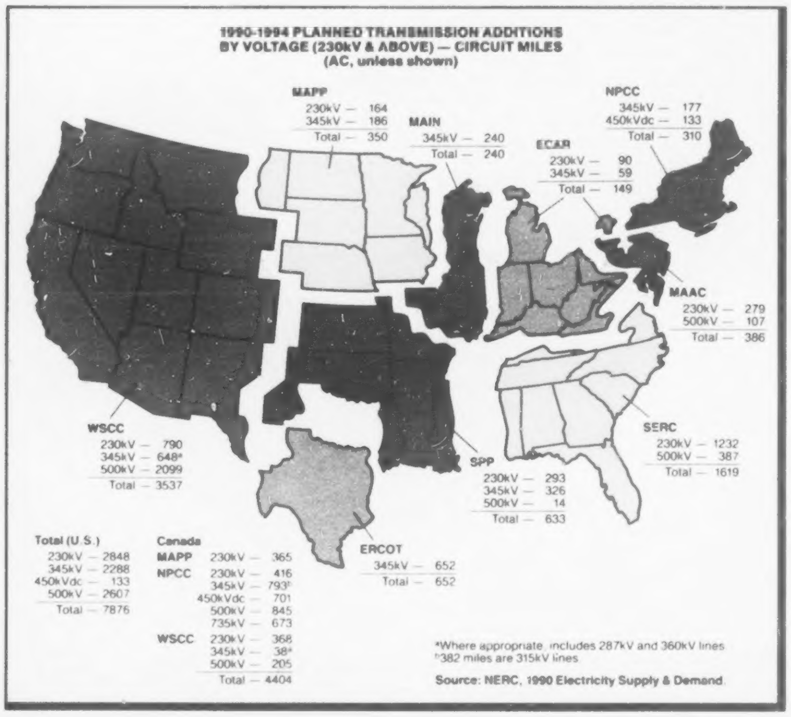
These figures are according to the report, *1990 Electricity Supply and Demand*, by the North American Electric Reliability Council.

Most U.S. voltage additions will be 230 kV, as was stated in the 1989, and 1988 predictions. In Canada, the predominant additions will be of 500-kV lines, a change from previous NERC forecasts.

Western Systems

The U.S. NERC region with largest gain in circuit miles 1990-94 is Western Systems Coordinating Council with 3537 (see map). That's more than double the second-place region, Southeastern Electric Reliability Council, with 1619 circuit miles planned.

During the period '95-99, WSCC also planned the most additions, with 2168, to SERC's 1038 circuit miles. Total U.S. additions '95-99 will be 5477; Canadian additions will be 4962, according to the report.


1990-1994 PLANNED TRANSMISSION ADDITIONS BY VOLTAGE (230kV & ABOVE) — CIRCUIT MILES (AC, unless shown)

Total (U.S.)

230kV	2848
345kV	2288
450kVdc	133
500kV	2607
Total	7876

Canada

MAPP	230kV	365
NPCC	230kV	416
	345kV	793ᵇ
	450kVdc	701
	500kV	845
	735kV	673
WSCC	230kV	368
	345kV	38ª
	500kV	205
	Total	4404

ªWhere appropriate, includes 287kV and 360kV lines
ᵇ382 miles are 315kV lines

Source: NERC, 1990 Electricity Supply & Demand.

Staff recommends that FERC approve 1500-MW storage project

WASHINGTON—The staff of the Federal Energy Regulatory Commission has recommended license approval for the proposed 1500-MW Summit pumped storage project to be built near Akron, OH.

The recommendation was included in the final Environmental Impact Statement for the project, released by FERC in mid-January.

The project would be developed, constructed and operated by Consolidated Hydro Inc., a Greenwich(CT)-based independent power producer, and its affiliates. If licensed as expected, the project would be the first independently-sponsored pumped-storage development to receive FERC approval. FERC's ruling is expected by mid-year, with construction planned to run from 1992 through 1998.

The developer is negotiating with Ohio Edison for sale of the plant's output, but no agreements have been reached to-date.

Another project is launched

Consolidated Hydro also was notified in early February that FERC will consider its application to build a 600-MW pumped-storage facility, the River Mountain project, in Arkansas. The plant, if approved by FERC, will be located near Russellville, about 80 miles Northwest of Little Rock. It is slated for operation in 1999.

Underground lower reservoir

The Summit project would use an inactive underground limestone mine as its lower reservoir and would construct a 195-acre surface reservoir in an area now under farm cultivation. The system would be self-contained and would not draw on existing bodies of water or streams. Initial fill of the upper reservoir, and makeup water to replace that lost through evaporation, would be through surface run-off and purchase from a nearby municipal water system.

Six 250-MW pump-turbines and motor-generators would be installed in the underground powerhouse, to be located about 2400 ft below the surface.

Summit Energy Storage Inc., an affiliate of Consolidated Hydro Inc., will develop the project while another affiliate, Consolidated Pumped Storage Inc. will be responsible for management of the Summit project. Consolidated Hydro is recognized as the largest independent owner-operator of hydroelectric facilities in the U.S.

Companies agree on joint technology

FOXBORO, MA—Sun Microsystems and The Foxboro Co., a Siebe Co., signed a joint technology and business agreement, allowing Foxboro to incorporate SPARC and other advanced Sun computer technologies in Foxboro's I/A Series industrial process management and control systems.

Foxboro also will market an integrated product offering to satisfy the requirements of their industrial automation customers.

The first three products, available February '91, are application interfaces to give engineers, managers and other supervisory network users direct access to plant production information. The products are the Foxboro I/A Series Application Interface Software, the I/A Series Open Application Platform, and the I/A Series Open Information Server.

from page 8

EMF concerns...

with distance.

Florida and New York

Two states, Florida and New York, have adopted a 200 mG exposure maximum at the edge of power-line rights-of-way (ROW). That level would pose little problems for utilities, but some groups are pressing for even lower limits. One study calculated that to bring power line fields down to a maximum of 100 mG at the edge of the ROW would cost $5 billion in Florida alone.

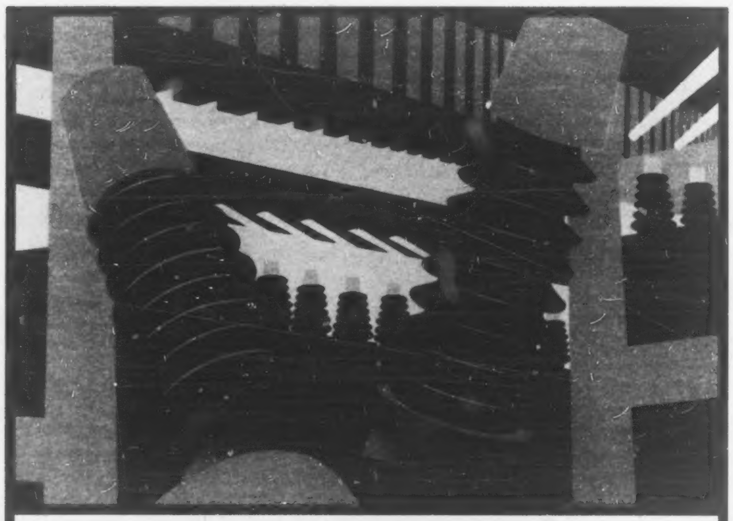
California starts study

The California Public Utility Commission opened an investigation of EMF health effects in three studies, in conjuction with the state Department of Health Services, to be completed in 1992-93. In a mid-January statement the PUC said it would, "determine whether it needs to change its existing rules, regulations, and policies regarding the operation, design, construction or siting of electric utility power facilities or cellular radio/telephone facilities to protect public health and mitigate potential health effects.

New transmission lines cost $750,000 or more per mile to install. If utilities are forced to remove or reroute them because of EMF concerns, it would simply add to their already high cost. Despite the cost, some utilities now include EMF and the proximity to people in their siting and design considerations.

Some people perceive that putting transmission lines underground would solve the EMF problem, but the earth provides no shielding against magnetic fields and in some cases might even increase the level of exposure to EMF. If the configuration and design is planned properly, underground lines will reduce EMF emission, but the cost can be as high as five times or more that of an overhead line and it would present some other operating problems.

More research is needed. Meanwhile, some sources promote reasonable and economical mitigation measures to guard against possible liabilities.



ELECTRICITY

Continuing to supply reliable electricity while keeping costs down has become a major challenge for the utility industry. Forecasts project further increases in peak demand. That's why there is renewed emphasis on energy management, whether supply side or demand side. There is no one solution.

We're RELM Demand Side Management, formerly Regency Load Management. For the past 12 years, we've worked side-by-side as partners with a number of leading utility companies, designing and supplying their VHF radio load management systems and equipment. Our switches are compatible with most codes and systems in use today. Our systems are customized for optimum flexibility and future expandability. Both have proven to be dependable and cost effective for large and small utility companies.

We've kept a pretty low profile over the past 12 years, quietly building a successful, solid reputation based on quality products, service and delivery. If you'd like to know more about how RELM Demand Side Management can work for you, call or write Bob Pinkley, Director.

RELM DEMAND SIDE MANAGEMENT
7707 Records Street • Indianapolis, Indiana 46226 • (317) 545-4281

MADE USA

Inquire R.S. 3

DSM market expands; some voice concern

Mark T. Hoske
News Editor

As much as half of the $450 billion annual U.S. energy bill could be saved if current conservation and load management technologies were used to the optimum level, say some estimates.

These include efficiency advances regularly promoted in utility programs: lighting, space heating and cooling, insulation, water heating, ductwork and pipes, windows and appliances.

Efficiency programs are expected to play an increasingly significant role at utilities, as some implement integrated resource planning, in which demand-side management (DSM) projects can compete with, and/or augment supply projects. But even without aggressive DSM projects, naturally occurring efficiencies will continue to affect utility planning through mandated appliance efficiency standards, rising energy prices, and research and development activities.

Efficiency savings embedded in utility forecasts of electric energy consumption in the year 2000 will be about 325,000 GWh, or an 8.5-percent savings, according to an estimate by the Electric Power Research Institute. The savings varies by end-uses, and is as high as 37.1 percent for residential freezers and 28.7 percent for residential refrigerators, EPRI said.

Although industrial load management has been an option for many years, utilities and various vendors are upgrading and advancing the technologies available for interruptions linking radio, telephone and/or power-line carrier, and metering technologies to manage residential, commercial and industrial loads. Computer advances help control and moniter load interruptions and reconnections at more affordable costs.

Some technologies offer more efficient use of electricity for the same purpose. Others switch industrial or commercial processes to increase output, saving electricity or other energy. So-called "smart" automation technologies help customers use electricity more wisely.

The (all) Electric Smart House, near Atlanta—with touch-screen computer technology, programable switches, appliance management, and sensors—uses half the energy of houses its size. The Gas Research Institute has a similar house for research in Maryland.

Utilities also add to energy efficiency by switching to high-efficiency transformers and improving conductors to reduce line losses, topics regularly covered in *EL&P*.

More traditional conservation measures that include some behavior change, such as decreasing consumption, generally seem less welcomed by consumers.

Even amid the Mideast war, consumers seem reluctant to change energy habits. A poll by the Gallup Organization after the Persian Gulf crisis began in August, showed that 10-percent or less of the people surveyed took any energy saving measures, despite 73 percent indicating the U.S. energy situation was very serious.

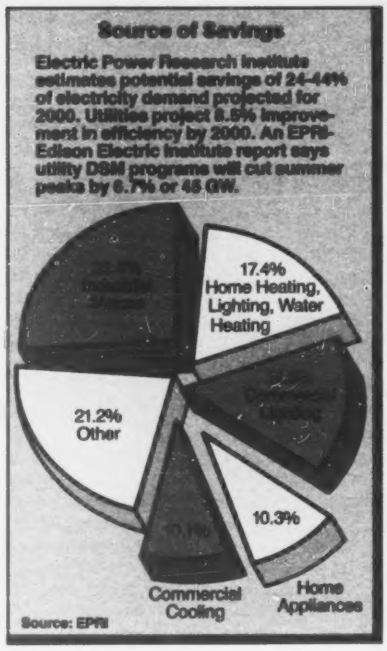
Without suggesting any political arguments or policy positions (and there are many), it might be startling that more is spent for one day of the Persian Gulf war than is slated for energy efficiency in the U.S. fiscal-year '91 budget.

Utilities recognize consumer reluctance when marketing DSM programs and are working on various efforts to improve. Some states' regulatory incentives also help boost participation in programs. Due in-part to regulatory prompting, California utilities are preparing sweeping efficiency plans.

"I think people recognize that demand-side management is something that's here to stay," indicated Patrice Ignelzi, executive director of the Association of Demand-Side Management Professionals.

"Utility management is finally buying into DSM, giving it clout, more on par with supply-side planning," Ignelzi said about the integration of supply and de-

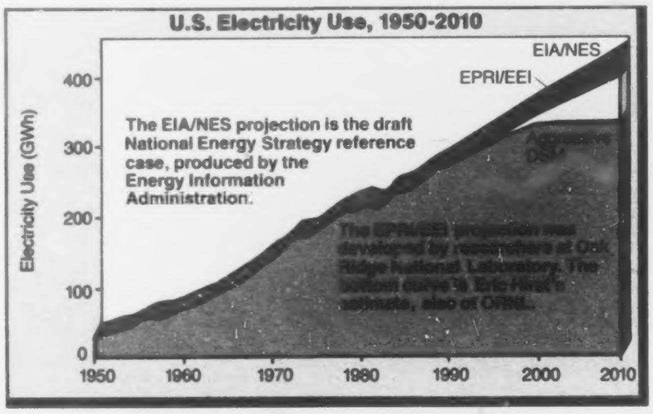
Continued on page 15


Source of Savings

Electric Power Research Institute estimates potential savings of 24-44% of electricity demand projected for 2000. Utilities project 8.5% improvement in efficiency by 2000. An EPRI-Edison Electric Institute report says utility DSM programs will cut summer peaks by 6.7% or 45 GW.

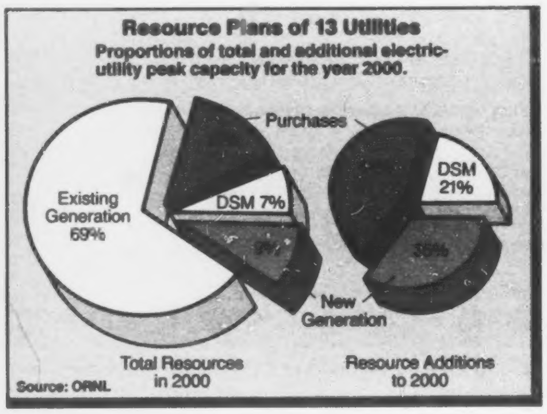
Source: EPRI

Focus
On Demand-Side Management


U.S. Electricity Use, 1950-2010

The EIA/NES projection is the draft National Energy Strategy reference case, produced by the Energy Information Administration.

The EPRI/EEI projection was developed by researchers at Oak Ridge National Laboratory. The bottom curve is Eric Hirst's estimate, also of ORNL.


Resource Plans of 13 Utilities

Proportions of total and additional electric-utility peak capacity for the year 2000.

Source: ORNL

Meetings, groups, courses

DSM and the Global Environment, April 22-23, Hyatt Regency Crystal City, Arlington, VA, $495, sponsored by 11 industry organizations. *Synergic Resources Corp. (215) 667-2160.* The groups include: Alliance to Save Energy, American Council for an Energy Efficient Economy, EEI, and EPRI.

1991 Lighting Efficiency Congress, a WORLDCON event, April 23-24, 1991, Disneyland Hotel & Convention Center, Anaheim, CA.

Lighting Efficiency Solutions, two-day seminars, Anaheim April 25-26, and Washington, DC, May 16-17. *Association of Energy Engineers, 4025 Pleasantdale Road, Ste. 420, Atlanta, GA, 30340; (404) 925-9633.* AEE was founded in 1977 as a professional non-profit society for energy engineers, managers, and others in the energy field. Has energy publications, seminars.

DSM Evaluation Training Seminar, May 1-3, Chicago, *EPRI, (415) 855-2887.*

Xenergy DSM Workshop, in conjuction with ADSMP, San Francisco, May 16-17. Three others planned in major U.S. cities. *Xenergy Inc., Executive Place V, 60 Mall Road, Burlington, MA 01803.*

5th National Demand-Side Management Conference, "Building on Experience," July 30-Aug. 1, Boston, by EPRI, DOE, EEI, Boston Edison, Synergic Resources Corp. *Contact Betsy Johnson, 5th National DSM Conference, 286 Congress St., Boston, MA, 02110; (617) 482-8228.*

The biannual National Energy Program Evaluation Conference, Aug. 21-23, Chicago, by Argonne National Laboratory, EPRI and others. *Contact Gail Ettinger, (708) 864-5651.*

8th Electric Utility Forecasting Symposium, Oct. 23-25, Baltimore, *EPRI, (415) 855-2855.*

Association of Demand Side Management Professionals (ADSMP) membership is open to any in the DSM field. Member services include an annual directory, a newsletter, discounts at ADSMP events, an electronic bulletin board, and other information. About 150 attended the first annual member meeting, in December. *ADSMP, P.O. Box 4658, Berkeley, CA 94704; (415) 528-5566.*

Master of Science in Lighting, and related courses, Rensselaer Polytechnic Institute School of Architecture, in association with the *Lighting Research Center, Troy, NY 12180, (518) 276-8716.*

Three variables dictate success of utility's load-control program

Robert S. Mason Jr., P.E.
President
Bayboro Consulting Group

A successful electric utility load-control program is dependent on many factors. But three variables generally must be present if such a program is to have any chance of success.

These are: 1. Customer acceptance 2. Hardware performance 3. Load reduction effectiveness. All three are implementation issues. A utility load control program is doomed unless all three can work simultaneously.

Realization of the importance of these factors is the result of experience compiled by Florida Power Corp., which is successfully operating the largest load management program of any electric utility in the United States. FPC currently has 300,000 of its 1-million customers, with about 600,000 user loads, on load management programs.

Florida Power's technology now is being marketed nationwide by subsidiary Bayboro Consulting Group Inc., and has been tested and perfected in the field over the past decade—from pilot to system.

After the first eight years of operation, the utility reports a cumulative total of only two percent of its load management customers cancelled their participation. Other utilities have been known to experience a 2 percent *annual* cancellation rate, or more.

G. Heber Weller, manager of load management and research for Florida Power, attributes his utility's low cancellation experience to customer satisfaction with the program. For one thing, he says, "customers like the dollar credits they get on their electric bills." At the same time, Florida Power gets a highly desirable reduction in load. "It's truly a win-win situation."

Florida Power's service territory includes 32 counties in northern and central Florida, in the heart of the fastest-growing big state in the nation.

"Despite the fact our territory is gaining population every day," Weller said load management programs have enabled the company "to achieve a reduction in load and thereby defer the need for some new plant construction."

He added that customer satisfaction is accomplished in a number of ways. "In the beginning," he said, "we tell customers to sign up for the whole program. If it works, fine. If not, they can take appliances off load control one at a time until they find their suitability range." He explained that customer service representatives explain the system very carefully, making certain that the customer fully understands what is involved.

Weller said Florida Power also is very

Continued on page 15

Utilities apply lighting advances, efficient motors in DSM programs

Demand-side efforts vary widely, from government investments, to utility programs, and association efforts.

A roundup of recent developments follows.

Lighting programs

Fluorescent bulbs save up to 75 percent of the energy of incandescent lamps and last up to 13 times longer, but they cost more.

Some utilities are working with lighting manufacturers to increase use of new, compact fluorescent lamps in residential markets.

Philips Lighting promotes lighting efficiency through its EARTHLIGHT programs. Philips EARTHLIGHT SL*18, provides the same light, 1100 lumens, as a 75-watt incandescent bulb, but uses 75 percent less energy. Suggested retail cost is $19.95, compared to about $1.19 for a 75-watt Philips incandescent bulb. For a variety of utility-sponsored programs, Philips negotiates price through bids.

Utilities have implemented various lighting programs, including donating lights to low-income housing customers, giveaway programs, and direct mail. Lloyd Chapman, of Philips said Green Mountain Power installed a free light with a water heater wrap; Northeast Utilities has given lights away; Philadelphia Electric Co. and San Diego Gas & Electric also have programs. Other utilities are investigating promotional efforts through retailers, Chapman added.

The EARTHLIGHT won the 1990 Discover Award for technological innovation in the environmental area. Philips Lighting is based in Somerset, NJ.

Four municipal utilities are involved in SMARTLIGHT leasing programs. A leasing program helps utilities with DSM goals by "renting" customers the bulbs for pennies a month. Customers reap energy savings at no capital cost. SMARTLIGHT is registered to Sylvania lighting. As previously reported, Taunton (Mass.) Municipal Light Plant's SMARTLIGHT program won the Energy Innovator Award from DOE and the American Public Power Association.

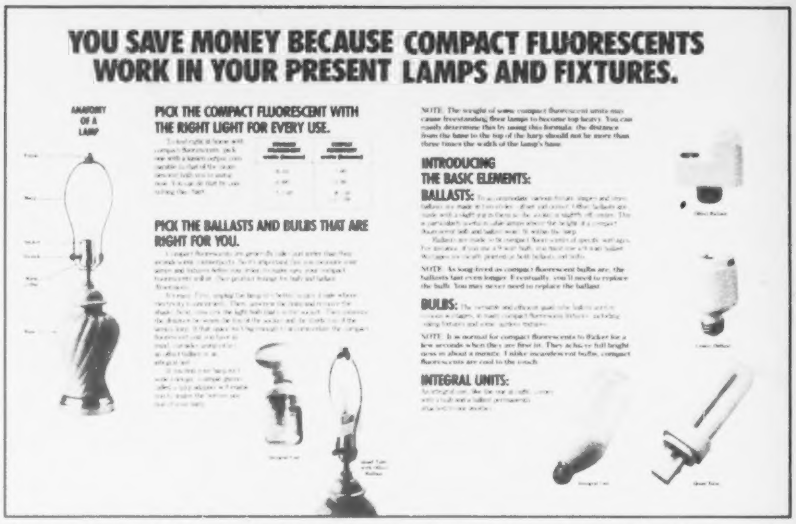
EPA promotes 'Green Lights'

The Environmental Protection Agency started the voluntary "Green Lights" program in mid-January to encourage the 1000 largest U.S. businesses to increase profits and decrease pollution with efficient lighting.

EPA said commonly available energy efficiency lighting could save 11 percent of all electricity used by U.S. businesses and, as a result, cut sulfur-dioxide emissions by 7 percent and reduce carbon-dioxide emissions by 5 percent.

Replacing lighting in all facilities with energy efficient lights cut the government agency's light bill by 57 percent, to 78,730 kWh/year, or $5,511.

Like many utility programs, the EPA's "Green Lights" promotes compact fluorescent bulbs for incandescent fixtures, tubes with higher lumen output, more efficient electronic ballasts, rather than conventional ones, and more effective lighting design and use.



YOU SAVE MONEY BECAUSE COMPACT FLUORESCENTS WORK IN YOUR PRESENT LAMPS AND FIXTURES.

ANATOMY OF A LAMP

PICK THE COMPACT FLUORESCENT WITH THE RIGHT LIGHT FOR EVERY USE.

PICK THE BALLASTS AND BULBS THAT ARE RIGHT FOR YOU.

NOTE: The weight of some compact fluorescent units may cause freestanding floor lamps to become top heavy. You can easily determine this by using this formula: the distance from the base to the top of the harp should not be more than three times the width of the lamp's base.

INTRODUCING THE BASIC ELEMENTS:

BALLASTS:

NOTE: As long-lived as compact fluorescent bulbs are, the ballasts last even longer. Eventually, you'll need to replace the bulb. You may never need to replace the ballast.

BULBS:

NOTE: It is normal for compact fluorescents to flicker for a few seconds when they are first lit. They achieve full brightness in about a minute. Unlike incandescent bulbs, compact fluorescents are cool to the touch.

INTEGRAL UNITS:

Northeast Utilities' Connecticut Light and Power Co. offers customers discounts on 35 energy-efficient lighting products in its "SPECTRUM Lighting Catalog." Bulbs and ballasts normally selling for $9-$13 cost $4; similar bargins are available on other equipment. These pages explain lamp design.

In a recent survey, the leading obstacle to selection of energy saving lamps is the higher initial price, according to 42 percent of respondents.

The Wagner Group, based in New York City, conducted the survey of 102 electrical contractors specializing in non-residential construction for GTE's Sylvania Lighting Division-U.S.

Other key findings were:

- 26 percent of electrical contractors said customers "seldom" request energy saving lamps.
- 27 percent said customers request them "some of the time."
- Facilities for which energy saving lights are frequently selected: Government facilities 72 percent, schools 70 percent, office buildings 61 percent, healthcare facilities 54 percent, manufacturing plants 50 percent, stores 47 percent, hotels 39 percent, and warehouses 34 percent.
- 49 percent said energy conservation is a serious issue today, with 80 percent expecting it to be serious issue 2000.

High efficiency motors

As with lighting, lifetime energy savings can dwarf the higher initial costs of high-efficiency motors.

High efficiency motors can consume up to 15 percent less electricity than older counterparts, said Ken Cornelius of Siemens Energy & Automation, Industrial Motor division. In addition, high efficiency motors bring 3-4 percent efficiency gains over standard efficiency motors, making use practical even a few hours a day, said Cornelius.

Utilities are among the large industrial users that would benefit from more efficient motors, using large motors greater than 200 hp to drive industrial air compressors, pumps, fans and coal crushers. Some utilities have promoted use of efficient high-horsepower motors among large customers, and the use of smaller ones through manufacturers' appliances.

Smaller motors consume a larger percentage of total power than big motors in nearly all household and business applications, for air conditioning, compressors, fans, blowers, pumps, and other uses, he said.

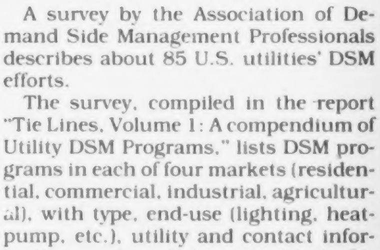
In one example given by Siemens, a 25-hp, 1800-rpm, high-efficiency motor costs $770, 30 percent more than a standard motor. But the motor could save more than $7000 in lifetime costs with utility rates at 8¢/kWh.

Association survey

A survey by the Association of Demand Side Management Professionals describes about 85 U.S. utilities' DSM efforts.

The survey, compiled in the report "Tie Lines, Volume 1: A compendium of Utility DSM Programs," lists DSM programs in each of four markets (residential, commercial, industrial, agricultural), with type, end-use (lighting, heat-pump, etc.), utility and contact information, and market segment (retrofit, new, or both).

The report, to be updated periodically, is to allow professionals in the industry to find help when developing new or modifying existing programs. It is available for members for $20 and non-members for $95 from ADSMP (p. 13).



Motors such as this one by Siemens Energy & Automation help large customers reduce load.

Focus
On Demand-Side Management

Survey: Load management projects even out

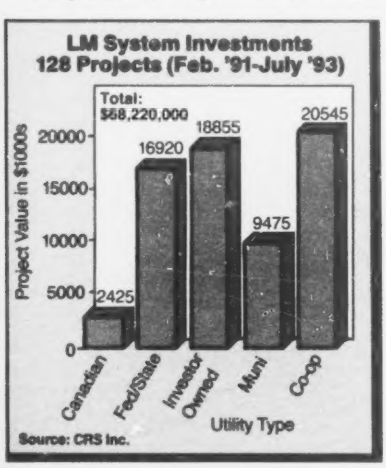
ROSEVILLE, CA—The number of load management projects (LM) appears to have leveled off among utilities, after doubling between 1986 and 1988.

Money spent on LM projects also is decreasing, with advances in technology. More small- to medium-sized utilities are establishing LM systems.

These findings are according to a survey of utility load management investments by CRS Inc. Preliminary results were presented at the International Symposium on Distribution Automation and Demand Side Management cosponsored by the Eureka Group and *Electric Light & Power*.

For the purposes of its survey, CRS narrowly defined load management within the larger catagory of demand-side management: LM projects remotely control load with on-off switches via a central computer. The study also covered distribution automation (see p. 24).

Comparable surveys showed 75 LM projects in 1986, 135 in 1988 and 128 in 1990. The dollar value of projects listed steadily declined from $132.3 million in 1986 to $90.17 million in 1988 to $68.22 million in 1990.



Source: CRS Inc.

In the 30 months starting February 1991, utilities plan to spend $68.22 million on LM programs. A few large programs will account for the most spending.

Municipal utilities have the largest number of LM projects planned, 54, representing 39 percent of the total. Rural electric cooperatives, with 38 projects, intend to spend the most, $20.5 million, or 42.7 percent.

Investor-owned utilities account for 12, or only 14.5 percent, of the total number of projects covered in the survey, but account for 39.2 percent of the dollar investment, $18.9 million.

CRS noted that, from past surveys, an average of 58 percent of utilities finish projects within the scheduled calendar years. Most utilities spend within 10-20 percent of the planned amount.

In the study, the number of LM projects by utility size matched directly the sample size of each group.

The projects were valued as follows:

- 128 system projects, $68.22 million.
- 162 switch projects, valued at $79.16 million. (These could modify existing projects.)
- 105 communications projects, $11.23 million.
- 31 projects for consulting engineers, $860,000.

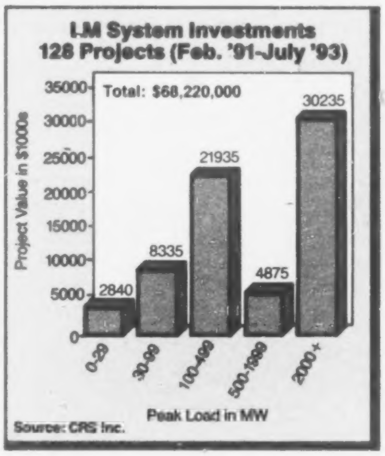
Study participants

The study of 1043 utilities was conducted from October 1990 through January 1991. By peak load, the utilities were:

- 95, 2000+ MW; 8 LM system projects are planned.
- 106, 500-1999 MW; 11 projects.
- 316, 100-499 MW; 45 projects.
- 348, 30-99 MW; 46 projects.
- 178, under 30 MW; 18 projects.

By utility type, they were:

- 89, Canadian; 13 LM system projects are planned.
- 75, federal, state, district; 11 projects.
- 145, investor-owned; 12 projects.
- 338, municipal; 54 projects.
- 396, rural electric cooperatives; 38 projects.



Source: CRS Inc.

For more information

CRS Inc. is a market research firm specializing in the study of control and data acquisition systems used in the electric utility industry.

For more information contact Gail Ossandon, CSR Inc., One Sierragate Plaza, Ste. 270-C, Roseville, CA, 95678; (916) 773-3344

from page 13

DSM market...

mand-side planning and the increasing level of commitment to DSM resources. DSM use has been more advanced in the Northeast and other areas with some short-run supply constraints, she pointed out, but added that "attention to it definitely is spreading."

The growth of ADSMP seems to reflect added growth in the industry, in-part, Ignelzi said, because people have made personal commitments/career decisions to DSM. The organization, started in December 1989, grew to 200 by January 1990, had 850 members in January '91, and expects more than 1200 by 1992.

Ignelzi pointed out that growth in DSM programs could be greater if the final version of the emerging National Energy Strategy (NES) placed as much emphasis on conservation and efficiency as indicated earlier in the process.

In the State of the Union Address on Jan. 29, President Bush affirmed plans to send to Congress "a comprehensive national energy stategy that calls for energy conservation and efficiency, [with] increased development and greater use of alternative fuels." Some sources indicate that free-market forces within the administration may prevail over efficiency mandates included in early Department of Energy NES drafts (*EL&P*, Feb., p.1). Ignelzi seemed to agree. "I very much get the impression that the Administration has been, and will continue to be, an obstacle to extensive efficiency incentives."

With or without strong incentives, Ignelzi suggested that market conditions would continue to advance DSM efforts.

In addition to some White House hesitation, the movement toward increased investments in DSM has other detractors. Some of these views suggest artificial regulatory or utility incentives counter free-market pricing incentives for conservation and efficiency.

The Electricity Consumers Resource Council (ELCON) said state utility regulators too often give DSM unfair advantage over supply-side sources. The Washington, DC-based group proposed limits, a "Demand Side Management Profile." These limits outline ELCON's view of DSM programs in least-cost planning efforts, and recommend procedures for identifying cost-effective DSM options, measuring actual resource value, and determining the level of financial incentives.

John Anderson, ELCON executive director, argued regulators must not require mandatory DSM programs—utilities should retain accountability and be subject to prudence and used and useful reviews.

Selected social costs, such as environmental externalities, should not be internalized. Actual costs, including environmental regulation compliance costs, should be used, Anderson said.

Prior to DSM programs, he said, utilities should set rates without subsidies, based on cost of service, to send appropriate price signals, including time-of-use, curtailable and interruptible rates. A resource plan should precede DSM investments; the most a utility should pay for a DSM resource is avoided cost minus the bill savings, he added.

---

from page 13

Load management...

careful to stress the quality of its customer service. "This program gives us an excellent opportunity to build good relations with our customers. When a customer calls with a problem, we are more than happy to show the customer exactly what we can do. Often, this is the first direct dealing the customer has ever had with the utility."

Load control equipment consists of the devices at the residence that receive the signal from the power company via some communications medium—radio, power-line carrier or telephone. A receiver does two things: it receives information over its communications medium to verify that it is working properly and it also receives information from the power company in order to turn house appliances off and on. In order to work properly, the device also must be wired into the home appliances correctly and it has to stay this way.

"You have to have a performance assurance system, which most often involves an on-site inspection program," Weller said. Bayboro Consulting Group is among companies offering such services.

Weller noted that Florida Power uses radio as its communications medium, utilizing 22 radio transmitters located throughout its service territory.

The third variable of a successful load-management system, load-reduction effectivesness, is determined on an aggregate average basis and involves an appliance strategy. "There are two kinds of appliance strategies," Weller said. "One is the kind where you 'shed' (turn load appliances off for long periods of time) and the other is the kind where you cycle them. Water heaters and pool heaters are in the first category and air-conditioners and heaters in the other."

Florida Power's load-control system allows the utility to achieve a peak winter load reduction in excess of 600 megawatts and a summer peak reduction of 300 MW. Deferred is the equivalent of 600 MW of peaking capacity.

In order to "fix" a deferred dollar value of the Florida Power system, the capital costs of peaking capacity first must be determined. Today, this is generally in the range of $400 per KW. Using this figure, the Florida Power system was able to defer about $240 million of capital investment (600 MW saved times $400 capital cost per MW.) This figure does not include the operating and maintenance costs of new peaking plants or the cost of the fuel.

Florida regulators allow utilities to recover the cost of load control from customers outside the rate base. Public service commissions in most states are becoming increasingly fond of load management and other energy conservation programs and in most cases encourage utilities to utilize them.

More economic distribution transformers aren't "somewhere down the road." They're on a lot of roads...today.

You'll find METGLAS* core transformers on roads in California and Florida, Washington and Maine, and most places in between. You'll find them on the poles and pads of America's most dollar-conscious utilities—saving energy and money through more efficient power distribution.

Lower core loss → reduced owning costs.

The no load loss of a METGLAS amorphous metal core transformer is about one-third that of the best conventional steel core unit you can buy—and more than 80% lower than the "average" 15-year-old transformer you may have in service today. Lower transformer power loss means reduced total ownership cost and the potential to defer generation capacity additions.

Proven reliability → dependable service.

Allied-Signal and the world's leading transformer manufacturers have invested two decades of engineering in the development of reliable METGLAS core transformers—a reliability demonstrated through EPRI-sponsored research and testing, over 25,000 transformer years of utility field service experience, REA approval, and ANSI functional life tests equivalent to 100 years of operation.

Economy + Reliability → Action

Compare METGLAS core loss—17 watts for 25kVA transformers and 50 watts for 100 kVA transformers—to those of the units you installed last year. Then call your transformer suppliers to learn how METGLAS Core Alloy can lower your owning costs, and call Metglas Products for more information on *the* ultra efficient transformer core steel.

We're cutting energy losses to the core.

Transformer Information Service
Metglas Products
6 Eastmans Road, Parsippany, NJ 07054
(201) 581-7600

© 1988, Allied-Signal Corporation

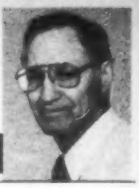
METGLAS

Allied Signal

Inquire R.S. 31

TRANSMISSION-DISTRIBUTION UPDATE

WAYNE BEATY, Senior Editor—T/D



Utilities told to expand DA/DSM involvement

PALM SPRINGS, CA—Speakers at the first International Symposium on Distribution Automation and Demand Side Management suggested expanding utility involvement in those areas, forecasting a bright market for related companies if the right steps are taken.

Co-sponsored by *Electric Light & Power*, the symposium attracted more than 400 engineering managers from investor-owned, municipal, cooperatives, federal, state and international utilities.

The three-day meeting, organized by the San Francisco-based Eureka Group, addressed the emerging technologies involved in substation, distribution feeder, and customer automation, as well as demand side management issues.

Forty presentations from industry consultants, utility managers, and manufacturers covered a broad range of topics, from wide-area communications to new customer interface devices.

Representatives from 11 countries added an international flavor to the meeting. Ten percent of the delegates came from outside North America. The Mexican firm, Sensa Control Digital, demonstrated its line of DRTs, the first time a Mexican manufacturer of this type product has exhibited in the United States, according to Sensa founder Filipe Garcia.

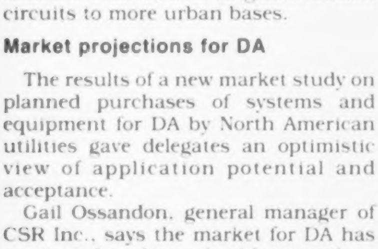
ABB Power Pty. Ltd., Australia described the progress achieved by utilities adopting its integrated distribution system automation products in the Asia/Pacific region.

Over half of the utility attendance came from investor-owned companies. The second largest group came from municipals and regional PUDs, many from high population areas. This may signal wider adoption of distribution automation (DA) philosophy, from its traditional stronghold in sparsely populated territories with long distribution circuits to more urban bases.

Market projections for DA

The results of a new market study on planned purchases of systems and equipment for DA by North American utilities gave delegates an optimistic view of application potential and acceptance.

Gail Ossandon, general manager of CSR Inc., says the market for DA has continued to show a healthy growth in the last five years. From a mere 39 projects planned in the 1986 study, the number of planned projects has grown to 177 new system projects valued at $70 million for the 30 months starting in February 1991. This is a growth of 220 percent over four years and is occurring across all size and type market segments.



Source: CRS Inc.

The study also identified:

- 45 RTU projects for $10.3 million.
- 97 communications projects valued at $11.5 million.
- 27 consulting engineering projects valued at $1.1 million.

Utilities with peak loads over 2000 MW will spend $35.9 million or 85.1 percent of all planned expenditures.

While the growth rate for DA projects may not be sustained in future years, it is clear that technology has driven market penetration to new levels that bode well for the near- and mid-term future of the industry.

The CRS Inc. study defines DA as real-time automation of feeders including reclosers, capacitors, regulators, or switches outside the substation and extending to the secondary side of the distribution transformer. (See also p. 14.)

Communications systems

Various wide-area communications technologies were presented and discussed in a surprisingly congenial panel session. Michael Olson, vice president of engineering, Cellular Data Inc. Robert Landman, president, H&L Instruments Inc., a fiberoptics company and David Warkentien, western region manager, Microwave Data Systems Inc., all agreed in their advice—make the right choice for the proposed installation by considering terrain, data to be handled, applications to be supported, investment capital available, and maintenance skill level. Compare the pro's and con's of each competing technology to the requirements and then move ahead.

An impediment to progress recurring through symposium presentations was the need for standards and interoperability among equipment. Wade Malcolm, project leader, Electrical Systems Division, Electric Power Research Institute, gave a well-received update on the progress being made towards adoption of the utility communications architecture (UCA).

Malcolm pointed out that the electric utility industry's annual expenditures on telecommunications equipment is in the range of $5 billion—second only to the telecommunications industry itself. Utilities rank as the number one users of real-time data. He suggested that interoperable systems and the adoption of non-proprietary protocols would save the industry over $1 billion per year in interconnection and translation costs.

Allen Skopp, marketing manager, Valmet Automation Inc., Houston, TX, a SCADA system and RTU supplier, discussed the increasing need for intelligent communications between equipment which formerly just "hooked up." From Skopp's point of view, the distribution portion of the industry is moving unstoppably in the direction of closer coupling between the different devices which, cumulatively, comprise the distribution network. "The real equipment, the stuff you can't do without no matter what, is becoming more sophisticated. We're seeing more and more companies with which we must interface electronically, not only high-current equipment such as circuit breakers, reclosers, and sectionalizers, but with smaller microamp-size equipment as well."

Need for standards

Some strong voices, including John Redmon, manager of planning and system design at Public Service Electric & Gas Co., stressed the need for utilities to take the lead in ensuring progress towards compatible systems and products.

First, he suggested, insist on an open-systems philosopy when purchasing products or systems. Second, make a commitment to helping the standards adoption process by participating in industry meetings.

Linda Finley, director of engineering at Snohomish PUD, suggested the possibility of cost-sharing for utilities for which the financial burden is too great. For example, share travel costs between a small company employing a particularly strong contributor and a large organization which will benefit substantially from the adoption of standards, but which has no one in particular to send.

Customer service

Customer service was advocated at the outset of the meeting as a key to success. In her keynote address, Finley stressed the need for utilities to *calculate* the value of customer service and to recognize the importance of *customer-perceived value*. Finley said, "The meter is the utility gateway to the customer and much more can be gained through the meter than just monthly billing data."

For those utilities that need help in learning more about opportunities for DA/DSM issues, Finley pointed to the many trade organizations, trade magazines, and EPRI as sources of help, information, and educational material for utility engineering managers. She said existing technologies offer sufficient benefits to make innovative customer service programs cost justifiable.

Roger Levy, president of Levy Associates, also espoused a closer look at the benefits of better customer service. Having recently organized a two-day roundtable session, Levy shared the insights of several large industrial customers who participated in the discussions.

From the customers' viewpoint, the benefits of advanced metering technology, and the possibilities of synergistic DSM techniques were so great that the customers themselves would, in many cases, be willing to foot the bill if the utility had programs to offer.

In response to the question, "Is your utility customer-oriented?" a show of hands indicated most thought they were. Levy pointed out that most industrial customers didn't feel that way, but were eager try new methods for energy control and billing techniques that most utilities don't consider to be cost effective.

The 1992 symposium will be in Fort Lauderdale, FL, Jan. 13-16, and will have an expanded program of user case studies. Copies of the Proceedings of the first International Symposium on Distribution Automation and Demand Side Management are available from the Eureka Group, Ph. 415/647-9003.

Check PCB disposal service carefully

GOLDSBORO, NC—Since most utilities depend on commercial firms to decommission PCB-contaminated (polychlorinated biphenyl) transformers, extreme care should be given to selecting the right company and to follow up with periodic inspections to ensure proper handling.

The clean-up costs for PCB contamination can be extremely high. In one case, a 2-gal spill cost $25,000 to clean up, and it was not in a waterway where costs can be even higher.

John J. Dougherty, manager of Environmental Compliance for Hevi-Duty Electric, offers these suggestions for utilities needing PCB-related services.

Transportation. The transporter should be responsible for receiving (or assisting in the preparation of) proper shipping documents, prevent the accidental leakage or spillage of transformer fluids enroute, address any such leaks or spills should they occur, and legally dispose of rain waters which may accumulate in the trailers during transportation.

Ask to see a copy of the Spill Prevention, Control, and Countermeasure Plan (SPCC) as required by regulations. Make sure the company has a sufficient fleet of the proper vehicles and a well-trained manpower source.

Equipment storage. Units should be stored in a manner which will prevent the accidental discharge of oil and PCBs into the environment. Ask to view the SPCC inspection records for the storage facility. If storage is outside, a roof is recommended for protection against the elements.

Testing. Make sure the company verifies the level of PCBs in the equipment before processing. Without verification, units exceeding the facility's permitted levels could be accepted and processed, incurring possible liability from the Toxic Substance Control Act and from employee claims of health risks.

Decommissioning processes. Materi-

Continued on page 26

C6985-6A

ELECTRIC LIGHT & POWER

EL&P

APRIL 1991
Volume 69, Number 4
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

President Bush promised to veto energy bills that do not lease some protected Arctic areas (below).

Canada and U.S. signed the Air Quality Accord March 13; Canadian law may tighten; a committee will tackle transboundary issues.

A crippling March 12 ice storm cut power to more than 200,000 Illinois/Indiana customers, some for over a week; see May *EL&P*.

Consumer groups' court challenge delayed CECo's rate hike for five days; the increase would be refunded if overturned (below).

More than 90% of Kansas Power & Light and Kansas Gas & Electric shareholders OK'd the merger. Regulatory votes are pending.

Square D talks with others—perhaps trying to avert French Groupe Schneider S.A.'s $1.98-billion hostile bid—after rejecting an offer. Merger talks failed.

Japan closed a second reactor, seeing Mihama-like flaws, p.17

National Energy Strategy

Document becomes platform for debate; Congress reviews related bills; despite war's end, Mideast instability fuels policy momentum

Mark T. Hoske
News Editor

WASHINGTON—"Implementation won't be easy," said President George Bush of the National Energy Strategy (NES), in-part perhaps because Congress already has introduced two energy policy bills of its own—in the Senate on Feb. 5 (*EL&P*, 3/91, p.1) and in the House on Feb. 18.

Nonetheless, the President introduced the NES here on Feb. 20, after initiating work on the project in July 1989. Some of his condensed comments on NES follow:

This is a strategy for a secure, efficient and environmentally sound energy future. It's designed to diversify sources, spur competition, increase energy efficiency, offer greater fuel choices, and enhance research and development. This strategy relies on the free market principles, without new energy taxes. It will help expand competition in the electric power business....and promote nuclear technologies of unprecedented safety and reliability. Use of renewable resources could increase 16 percent.

Implementation won't be easy...it will draw on the nation's resources and resourcefulness. The White House will be fully involved to negotiate with congress to put through legislation, while using the powers of the executive branch.

Secretary of Energy James D. Watkins said, in a separate statement, that the overall strategy would cut U.S. demand for oil by 3.4-million barrels per day by 2010, while increasing alternative transportation fuels—including electricity—by the equivalent of 3-million barrels per day by 2010. Watkins, too spurned "command and control measures," such as increased government regulations and taxes. A major element of the NES is increased investment in energy technology R&D, including more than $900 million in FY 1992 (up 34 percent) for investments in support of NES R&D initiatives.

As previously reported in *EL&P*, the 19-month process began with the President's July 26, 1989, request that the Department of Energy develop a comprehensive national energy strategy. Three rounds of 18 public hearings were conducted in 14 cities, with five in or near Washington, DC. Witnesses numbered 448, from 46 states, two U.S. territories and two Canadian provinces. More than 2000 written comments were submitted to DOE directly. A total of 29,000 pages of written material was compiled, DOE said.

White paper workshops, interagency review through the Economic Policy Council and DOE inputs followed, with a modeling effort to create a base case. The Secretary of Energy's Advisory Board helped analyze the first draft. A summary analysis was made public. Final DOE review and refinement preceded submission to the president. The administration made more revisions, with DOE assistance, prior to Feb. 20.

Sen. J. Bennett Johnston (D-LA) and Sen. Malcom Wallop (R-WY) on the Energy and Natural Resources committee introduced energy legislation on Feb. 5, containing some initia-

Continued on page 3

Three vie for EEI's Edison Medal

WASHINGTON—Three electric utility companies have been nominated for the Edison Award, the highest honor given by the Edison Electric Institute, the trade and lobbying association of the investor-owned electric utility industry.

The three, selected by a special Edison Electric Institute review committee headed by *EL&P* Editor-in-Chief Robert A. Lincicome, are General Public Utilities Corp., Pennsylvania Power & Light Co. and Wisconsin Electric Power Co.

The companies have been invited to prepare and submit documentary presentations covering their cited accomplishments, which will be judged by a panel of independent experts.

Continued on page 8

Ice storm hits New York utilities
Hurricane-like damage, say some crews

Full story, p. 12

A lineman untangles wires from a snapped Rochester Gas & Electric pole

ComEd gets relief, 14% rate increase; consumers oppose

CHICAGO—Illinois regulators granted Commonwealth Edison Co. (CECo) a 14-percent, $750-million rate increase to help pay for three nuclear plants.

The March 8, 6-1 decision was 40-percent smaller than CECo sought and more than ratepayers wanted.

Consumer groups promised litigation to attempt to overturn the decision, saying only one of the three units was needed. The northern-Illinois electric utility sought a 23-percent, $1.23-billion rate hike. On Feb. 7, regulatory hearing examiners recommended a 9.8-percent increase.

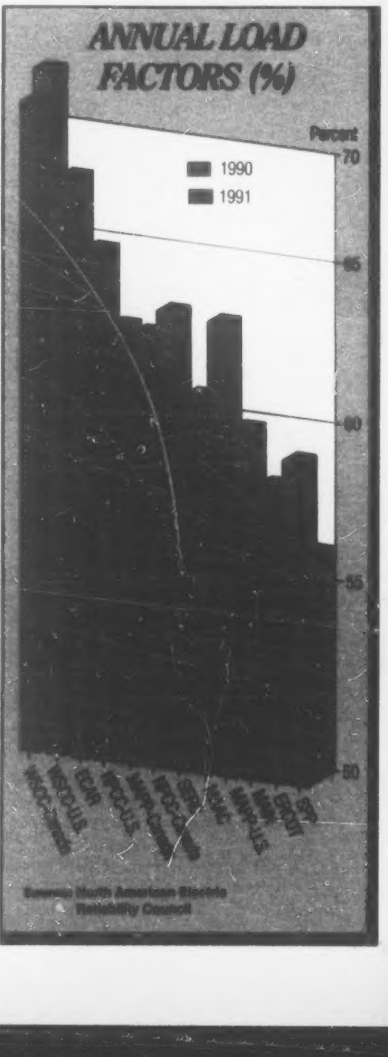
The commission disallowed $733.8 million, saying 10.3 percent of the $7.1-billion cost for the three units was not reasonably incurred. However, the ICC agreed with CECo that all three plants are needed, calling them "used and useful." CECo was allowed to recover $1.73 billion of the $2.07 billion in deferred

Continued on page 6

INSIDE:

More on energy policy, pp. 3, 4, 31

Underground power delivery, p. 26



*************5-DIGIT 20814
4100127302*040191 000000 1229
SUITE 800 COPY # 1
CONGRESSIONAL INFO SERVICE0021 F
4520 EAST WEST HWY
BETHESDA
MD 20814

NEWS BRIEFS

JILL MINNER, Special Projects Editor

DOE estimates cost of Super Collider

The Superconducting Super Collider project will cost an estimated $8.249 billion, according to a report released to Congress by the Department of Energy. DOE said the project, to be conducted in Ellis County, TX south of Dallas, is scheduled for completion in Fiscal Year 1999.

The Super Collider will be the world's most powerful particle accelerator, a basic research tool to explore the fundamental properties of matter and energy, according to DOE.

Ruling allows CLECO to begin electric service

As a result of a recent Louisiana appellate court ruling, Central Louisiana Electric Co. (CLECO) may provide electric service to the City of Opelousas, LA for 10 years beginning in August 1991.

The city's current electric supplier had filed suit contesting the city's authority to contract with CLECO based on the results of an October 1989 referendum. The court ruled that the referendum results were valid.

Sierra Pacific files amended resource plan

Sierra Pacific Power Co. announced that it has filed amendments affecting the supply side of its Electric Resource Plan with the Nevada Public Service Commission.

In its amendment, the utility requests approval of power contracts it has negotiated with energy suppliers to purchase 107 MW. In addition, Sierra Pacific is seeking to increase efficiency and add to the capacity of its electric system by rebuilding one of its existing hydroelectric plants and interconnecting two existing transmission lines.

The plan was originally approved by the PSC in 1989. Sierra Pacific is expected to file its next Electric Resource Plan in July 1992, according to the utility.

Shareholders tell ACC: accept Palo Verde audit

The Pinnacle West Shareholders Association (PWSA) said it has filed a motion to require the Arizona Corporation Commission (ACC) to accept the results of its $46-million prudence audit of Arizona Public Service's (APS) Palo Verde Nuclear Generating Station, and to adhere to the conditions it had set before the audit was conducted.

According to the PWSA, the ACC agreed to precise standards that would be used to determine whether APS' management decisions and expense outlays were reasonable in building Palo Verde. The ACC also issued an order asserting that the findings of the Ernst & Young audit "would conclusively determine" how much of APS' investment in Palo Verde would be allowed in rate base.

The auditors found that only $50 million of APS' $2.6 billion investment in Palo Verde was spent imprudently, and that was more than offset by $183 million in savings from superior construction management, the PWSA said. The ACC has refused to include the auditors testimony in the APS rate case it is conducting, according to the PWSA.

"We instructed our attorneys to file this motion because it's absolutely wrong for this commission to change the rules they made simply because they don't like the way the audit came out," explained PWSA Chairman Keith Sprinkle.

PacifiCorp/Utah Power savings up after merger

According to PacifiCorp, its merger with Utah Power & Light Co. has resulted in total actual savings for 1990 of $90 million, much higher than the company's original goal of $70 million.

The preliminary breakdown of savings shows: $25 million from power supply; $24 million from manpower efficiencies; $18 million from insurance; and $23 million from other areas, PacifiCorp reported.

NRC extends Pilgrim's operating license

Boston Edison Co.'s Pilgrim Nuclear Power Station has received an extension on its operating license from the Nuclear Regulatory Commission, according to Boston Edison Senior Vice President-Nuclear George W. Davis. The new expiration date for the extension, which was originally requested in 1986, is June 8, 2012.

Supply behind demand for energy-efficient lighting products

It may be two years before the supply of energy-efficient lighting products catches up with the increased demand, according to a report completed for Northeast Utilities by Arthur D. Little, an international management and technology consulting firm.

The report states that due to the industry's increased committment to energy conservation, demand will continue to grow significantly, probably beyond recent rates. "Manufacturers admit that the huge increase in demand over the last year or two caught them by surprise," the report notes.

Utilities are encouraged to carefully weigh supply and demand before embarking on investment-intensive conservation programs. "In the short term, participation in these conservation programs may suffer because consumers cannot get the [energy-efficient lighting] products," says Marc Rubin, a senior consultant at Arthur D. Little.

AEP joins GEMI

American Electric Power Service Corp. announced that it has joined the Global Environmental Management Initiative (GEMI), a coalition of major corporations formed to foster environmental excellence by businesses worldwide. "We are delighted to welcome AEP to this distinguished group of American companies who are seeking to contribute in a substantive way to improving corporate environmental management," said GEMI Executive Director Susan F. Vogt.

Other U.S. companies that are members of GEMI include: Duke Power, Florida Power & Light, The Southern Company, General Electric, AT&T, Boeing, Dow Chemical, Eastman Kodak, DuPont, IBM, Occidental Petroleum, Proctor & Gamble, Tenneco, Union Carbide and USX Corp.

NRC reviews Kewaunee

Wisconsin Public Service Corp.'s Kewaunee nuclear plant received a slight decline in performance rankings from the Nuclear Regulatory Commission in its Systematic Assessment of Licensee Performance (SALP). Region 3 NRC Administrator A. Bert Davis noted that the "performance decline was primarily due to weaknesses in management oversight of some activities." "Additional management attention appears to be needed to return Kewaunee to its previous exemplary level of performance," Davis added. The plant had received a perfect score in a previous rating, according to WPSC. "This is still a good report card, but not up to the level we would like to see. Our challenge is to get [it] back to the scores of the previous SALP," stated Ken Evers, WPSC manager-nuclear power.

Personnel briefs

Dan Bollom, president of **Wisconsin Public Service Corp.**, has taken over as chief executive officer of the company. Bollom, who will continue as president and chief operating officer, succeeds Linus Stoll who retired Feb. 28.

General Public Utilities Corp. (GPU) appointed Bruce L. Levy president of Energy Initiatives Inc. (EI), the cogeneration development subsidiary of GPU. Levy replaces Philip C. Mezey, who was named chairman of Energy Initiatives.

Jerry L. Maulden was named group president of **Entergy Corp.** and **Entergy Services**, and is responsible for the utility's newly established distribution and customer service organization. In his new position, Maulden also serves as chairman and chief executive officer of **Louisiana Power & Light Co.** and **New Orleans Public Service Inc.** Maulden succeeds James M. Cain who was appointed vice chairman of Entergy.

Public Service Co. of CO resigns from INPO

The Institute of Nuclear Power Operations (INPO) announced that Public Service Co. of Colorado (PSC) has withdrawn its INPO membership. The utility resigned following the permanent shut down of its Fort St. Vrain Nuclear Generating Station in August 1989. In addition, PSC is no longer a member of the National Academy for Nuclear Training, according to INPO.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Consolidated Edison Co. of New York

A $62,500 fine for alleged violations at the Indian Power Unit 2 Nuclear Generating Station. An NRC investigation found employees deliberately falsified maintenance completion documents after working on a waste gas system.

Georgia Power Co.

A $50,000 civil penalty for alleged violation of NRC security requirements at the Vogtle nuclear power plant. The violation included five instances where safeguards information was unsecured, unprotected or unattended, the NRC said.

Northeast Utilities

A $50,000 civil penalty for two violations of technical specifications at the Millstone 2 nuclear power plant. The violations involved improperly opened valves which could have allowed radioactive contaminants to escape. The problems were corrected and did not result in any risk to the safety of the public.

Virginia Electric and Power Co.

A $50,000 civil penalty for alleged violation of NRC requirements at the Surry nuclear power plant. After testing the service water flow, the NRC found that two recirculation heat exchangers on Unit 1 did not allow for the required flow rate under certain conditions.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Commonwealth Edison gets a "used and useful" ruling and a rate increase. 1
Industry groups comment on National Energy Strategy and legislation. 3
NRECA, at annual meeting, recommends support for federal loan program 6
Two more Iowa holding companies plan to merge. 8
Investor-owned utility financings fall in 1990. 15

GENERATION TECHNOLOGY

A ceramic burner may reduce NOx emissions and burn fuels more efficiently. 17
Kansai Electric cleanup proceeds after tube bursts, radioactivity released. 17
Reburning-type fuel loaded into EBR-II will go into the Intgral Fast Reactor. 18
CFB plant synchronization marks completion of a five-year project. 19

T&D TECHNOLOGY

Software aids planning/operations decisions. 20
SF_6 switching moves overhead. 20
Noise barrier makes substation a good neighbor. 20
Oil reclamation even more important in war aftermath. 20
Underground T&D: Special Focus Report. 23

REGULAR FEATURES

Commentary and **Letters** 4
Rate Activity 11
Labor/Management Concerns 13
Financial Performance 14
Information/Control Systems 32
Calendar 34
New Products 36
Readers' Service 39
New Literature 42
Regulatory Review 44
Management Methods 45

COMMENTARY

Thoughts while listening to rain on the window at 3 a.m.

It's funny what slips out of the darkness and sneaks into mind while you lie awake in the middle of the night.

Oil was what crept into my consciousness first while lying there listening to the rain splashing gently against the glass. More specifically, I started to think of where we might be as a nation if oil were NOT the driving force behind so much of our social, economic, industrial...and military...development in the U.S. (like many developed countries).

Simplistic though it may be, it occurred to me that if we had gotten off the oil standard after the Arab Oil Embargo in 1973-74, we might be a far different nation today. Consider what might have happened if the government had given the automobile industry a 15-yr progressive timetable to raise its fleet efficiencies to 40 mpg, along with a set of penalties and awards to be assessed against each model for its individual performance...with no exceptions, extensions or exclusions. The penalties/rewards per vehicle could have been high enough to capture managements' attentions...perhaps in the range of $100 per mile of difference between actual and target performance.

And to be fair, consumers could have shared penalties and rewards also, by assessing state license fees based on each model's published mileage performances, as verified by an independent testing organization.

What would have happened if oil-burning industrial organizations—including electric utilities—had been given a grace period of 5 or 10 yr in which to change to some other energy source or begin to pay an energy tax of $1 per gallon or more?

I have the feeling we would have a lot of very efficient conventional automobiles. More beneficially, I believe by now we would have a broad selection of high performance electric-, natural gas- and other derived-fuel-powered cars to choose from.

More factories and other businesses would have switched to electricity for its cleanliness, economy and ease of use; or natural gas; or, in some cases, even coal with its handling and cleanup costs.

Had this happened in the decade and a half following the disruption to the flow of Arab oil in 1973, our thirst for oil would have been slaked and our dependence on foreign oil diminished sharply. We probably would have a substantially more electrified nation, one that would be environmentally cleaner. Moreover, we probably would not have gone to war with Iraq, despite the obvious political gains that action provided the administration, or despite the violations to the rights of Kuwaiti people.

But the government—timid legislators, and administrations, at first ineffectual, then refusing to assume responsible energy leadership under the guise of allowing market forces to prevail—looked the other way. Now we are at a time similar to when the Mideast oil flow stopped in 1973. Have we learned the fallacies of remaining on the oil standard? (Electric utilities have applied some lessons.) Must the U.S. relive many of the same mistakes?

Energy policy, another thought in the early morning darkness, clearly follows oil. The National Energy Strategy—as envisioned by President Bush, and others in various bills—has become today's policy pursuit. It may be on its way to reality. There are many points various groups endorse, but other points, those same groups, and others, must oppose.

The biggest problem, it seems to me, is that the President has gotten his proverbial cart before the horse. Normally, you set up specific goals first. Then you figure how best to achieve them. Determine the objective, the end first; then select the strategies most likely to bring those objectives to fruition. Of course NES goals are mentioned in describing why a particular strategy is recommended. But there was no concensus agreement to the goals to begin with, and sometimes the means appear to be more important than the end. Emphasis is too heavy on supply-side rationale and continuance of market forces for direction. Conservation is endorsed, but without the kinds of commitments many expected. Environmental enthusiasts find little to cheer.

This National Energy Strategy seems to be an interesting, perhaps even important exercise. But for all the preparation time, effort and money—before administration revision—many had hoped for more...and better.

Robert A. Lincicome, EL&P Editor-in-Chief

EL&P® ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher

Robert A. Lincicome
Editor-in-Chief

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
B. J. Davidson, Assistant Editor
Dianne Wilson, Editorial Assistant-Products/Literature
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402, (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

Combating zebra mussels

The January issue of *Electric Light & Power* carried an informative article about zebra mussels (p.39), the freshwater mollusk that has invaded the Great Lakes and that poses significant peril to many [power] plants.

One statement in your article, however, needs correction and clarification. The article states "...bromine-based molluscicides must be neutralized before they are discharged in the water." Nalco's Acti Brom technology is the only bromine-based molluscicide currently approved by the USEPA for use as a preventive strategy in the war against zebra mussels. In many plant cooling-water systems, Acti Brom's use will not require post treatment to remove halogen residuals. Where such a [treatment] is needed, as determined through development of site-specific plans and rulings by state regulators, sodium bisulfite can readily be used to destroy halogen residuals. This activity is not a "neutralization" step and is not required at most locations.

Edward W. Ekis, Jr.
Utility Chemical Group
Nalco Chemical Company
Naperville, IL

Total quality management

As a 30-yr Quality professional, I was very pleased to see your article on Total Quality Management in the December 1990 issue of *EL&P*. It might be of interest to you and your readers that the Energy Division of the American Society for Quality Control identified Total Quality Management as the "Stairway to Success in the '90s" at its annual conference last year. Many utilities, OEMs and AEs shared their experiences with implementimg TQM and quality improvement programs. We expect to hear more on this subject this October at our 18th annual conference, [to be held] in Danvers, MA.

I would suggest that the only weak point in the piece was that the graphics accompanying the article did not do much to clarify the survey results. The use of 3-D graphics in this application presents a confusing and cluttered appearance. For example, in the graphic entitled "Satisfaction Levels," it appears that 100 percent of respondants were dissatisfied with "Quality of Life," 25 percent were satisfied and 62 percent were neutral. A two-dimensional graph for this and the "Levels of Emphasis" would have more correctly visualized the survey results.

Paul M. Velk, CQE
Quality Assurance Manager
Siemens Power Corporation
Bradenton, FL

White LED

In researching your publication, I noticed a press release run in the January 1991 issue. We have received several inquiries as to the validity of our competitor's "white light" and respond with the enclosed retraction copied from the January '91 issue of *EE Product News*.

[The clipping from *EE Product News* stated that its published new product announcement about WhiteLite LEDs made by Ledtronics Inc erroneously said that the LEDs emitted a white light, when in actuality the multi-chip devices emit a pale yellow light that falls between the 565 nm (green) and 635 nm (red) color spectrum.]

The information Ledtronics released is extremely misleading. The reality of a white LED being available is in the future. White LEDs will require at least 10 percent blue light, and a sufficiently bright blue LED with an acceptable life expectancy is not yet available. The first announcement of such a product will undoubtedly come from Hewlett Packard, Stanley or us—but not Ledtronics.

Nancy Bateman
Marketing Communications
Data Display Products
El Segundo, CA

Editors note: Not to argue with Ms Bateman, but the item on the Ledtronics WhiteLite specified that the light was, in fact, in the amber-yellow spectrum between 565 and 635 nm., with an illumination level nearly twice as bright as present amber-yellow LEDs.

EEI publishes industry statistics

WASHINGTON—The Edison Electric Institute has published the *EEI Statistical Yearbook of the Electric Utility Industry/1989* and the *EEI Pocketbook of Electric Utility Industry Statistics/1990*, which is the latter's 36th edition.

The full-size, softcover *Yearbook* is an authoritative source of facts and figures about the industry. It contains national and state statistics on: generating capacity; electric generation and supply; sales, revenues and customers by class of service; energy data; fuel use; financial data; and general economic material. Besides the softcover hardcopy, a floppy disk version is available that contains 89 Lotus 1-2-3 files that can print out as close approximations of the hardcover tables.

Hardcopy price is $40, with member companies getting a 20-percent discount. Floppy price is $45, also with a 20-percent member discount.

The 3½ X 6¾-in. *Pocketbook* contains 1989 data also, but is designed as a quick reference to information about the electric utility industry. The booklet contains details on: capacity and production; capital and finance; sales, revenues and customers; government ownership; and other items. Price is $3 per copy, and members get 20 percent off here, too.

Order copies from: Edison Electric Institute, 701 Pennsylvania Ave., NW, Washington, DC 20004, Attn: Order & Billing; or call 202/508-5424; or fax 202/508-5794.

413 nuclear units operated in 1990

LAGRANGE, IL—Worldwide, 413 reactors operated in '90, while U.S. commercially operated 111, says the American Nuclear Society (ANS).

Operating reactors were: 234 pressurized light-water (PWR) for 200.9 GW, 88 boiling light-water (BWR), 71.7 GW; 39 gas-cooled, 13.5 GW; 29 heavy water, 15.7 GW; 19 graphite-moderated light-water, 14.9 GW; and 4 liquid metal fast breeder, 1.2 GW. ANS publishes a world list of nuclear power plants in its member magazine, *Nuclear News*. The list includes MW, type, percentage construction complete, date of criticality and start, reactor and generator supplier, architect engineer, constructor, units no longer in service, units by nation, and by reactor type.

Investor-owned utility financing declines

ATLANTA—Investor-owned electric utility financing in 1990 was $7.95 billion, 36 percent less than the $12.49 billion in 1989, according to Ebasco Services Inc. In comparison, alternative energy project financing was $1.2 billion for 1990.

See the table for additional figures.

Ebasco's *Analysis of Public Utility Financing* for 1990 reports that total financing of alternative energy projects amounted to $1.2 billion.

By technology, the breakdown was cogeneration, $535 million; wind $154 million; and independent power, $540 million.

Ebasco Services Inc. is an engineering, constructor and consulting firm.

Offerings of Securities by Investor-owned Utilities ($000)

	1990		1989		'89-'90
	Electric	% of Total	Electric	% of Total	% Change
Long Term Debt	7,017,759	88.3	10,994,212	88.0	-36.2
Preferred Stock	715,850	9.0	720,000	5.8	-0.6
Common Stock	216,775	2.7	771,961	6.2	-71.9
Total Financing	7,950,384	100.0	12,486,193	100.0	-36.2
By Type of Sale					
Public	7,619,384	95.8	9,764,193	78.2	-22.0
Private	331,000	4.2	2,722,000	21.8	-87.8
By Purpose of Sale					
New Money	6,170,289	77.6	9,459,443	75.8	-34.8
Refunding	1,780,095	22.4	3,026,750	24.2	-41.2
By Method of Sale					
Competitive	2,005,000	25.2	2,380,000	19.1	-15.8
Negotiated	5,614,384	70.6	7,384,193	59.1	-24.0
Private Sales	331,000	4.2	2,722,000	21.8	-87.8

Source: EBASCO Business Consulting

Two firms integrate emission controls

HOUSTON—NaTec Resources has entered into an agreement with Lodge-Cottrell, the environmental products division of Dresser Industries, to develop and market integrated turnkey emission control systems for the utility and industrial markets.

The systems for removing SO_2 and NO_x will include NaTec's dry sorbent technology and Lodge-Cottrell's electrostatic percipitators and fabric filters.

NaTec also has announced that it has signed an exclusive contract to market advanced flue-gas desulfurization wet scrubber technology from Saarberg-Holter Umwelttechnk (SHU), a German environmental firm.

GNP growth trails electric demand hike

GAITHERSBURG, MD—The relationship between Gross National Product, the U.S. output of goods and services, and electric demand has become more apparent since the mid-1980s, but electric demand has outpaced GNP by 30 percent, according to John R. Siegel, vice president, Bechtel Power Corp.

"Despite slower growth in the economy—GNP was up only 1 percent in 1990—electric demand held up strongly, gaining 2.5 percent," said Siegel, citing the weather-normalized Department of Energy demand figure.

The primary reasons for the relative jump in electric demand, Siegel explained, are falling real electric prices, a contributing manufacturing sector, and technology and environmental factors favoring growing electricity use as a percentage of U.S. energy used. "Each of these trends is forecast to continue through the first half of the 1990s."

"For 1991 DOE (as well as Blue Chip economic forecasters) expect year-over-year GNP to be flat. Despite no economic growth, DOE is forcasting a 1-percent rise in electric demand," he says.

For more discussions of economic outlook, reserve margins, and electricity prices, see May *EL&P*.

NRC tells states of safety concerns about 'incentives'

WASHINGTON—Federal regulators recently told state regulators they're worried about potential safety hazards that nuclear plant performance incentives might create.

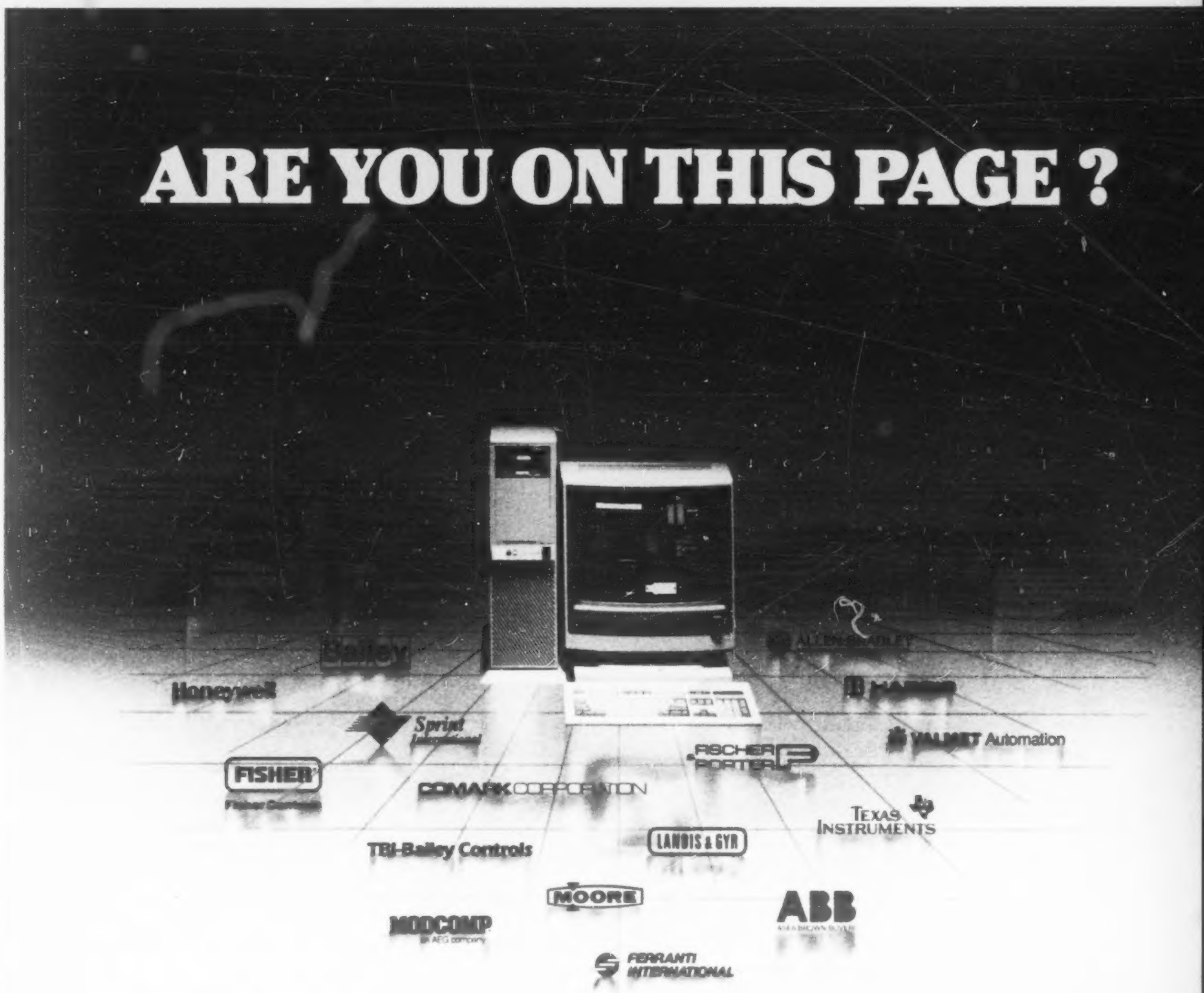
State regulators in 1[illegible] states have economic performance incentives intended to promote operation of nuclear power plants and, in some cases, penalize low capacity factors. Sixteen units, and 27 utilities are involved.

May become formal policy

The Nuclear Regulatory Commission discussed a draft policy statement, "Possible Impacts of Economic Performance Incentives," Feb. 27, with members of the National Association of Regulatory Utility Commissioners, at the NRC headquarters building in Rockville, MD.

Regulators called the meeting productive and said they would like to continue the dialogue.

Previous NRC discussions of the issue revealed fears that such incentives could impair safety procedures, an NRC spokesman said. Last year, New Jersey state regulators broadened their nuclear performance standards, making it harder to get penalties and easier to get rewards.



*All names above are used with permission of the registered owners.

Leaders in the Process Control Industry
Use Aydin Man-Machine Interfaces.

They've Made Their Choice.
Find Out Why.

Call 1-800-366-8889

AYDINCONTROLS

414 Commerce Drive • Fort Washington, PA 19034-2602
TEL: 215-542-7800 • TLX: 173174 AYDNCT UT • FAX: 215-628-4372

European Headquarters:
1/3 Hunting Gate, Hitchin, Hertfordshire, SG4 OTJ, England
TEL: Hitchin 462-458804 • TLX: 826626 AYDIN G • FAX: (0462) 456761

Inquire R.S. 9

GENERATION UPDATE

HENRY STEIN, Senior Editor-Generation

Ceramic burner promises to reduce NOx emissions without scrubbers

The flame in this unit burns inside a ceramic block. Its emissivity is about 10 times that of an equivalent open flame

AUSTIN, TX—The Center for Energy Studies researchers developed a different type of burner that may utilize heat from fuel more efficiently and give off less NOx than an open flame. In the units tested at the Center in the University of Texas at Austin (UT), the flame burns *inside* a porous block of ceramic.

The material is known as reticulated porous ceramic, and it contains large, interconnected pores among zirconia filaments—the pores make up about 80 percent of the volume of the ceramic.

High emissivity

The emissivity of the natural-gas-fueled ceramic burner flame is higher than that of "free" flame because an open flame is a poor radiator of heat. Therefore, the ceramic system will probably compete with radiant furnaces, rather than with mainly convective ones.

What it is, how it works

Each burner prototype is made up of a ceramic block surrounded by insulation, sensors to measure gas temperature and composition, a gas supply tank, a unit to control gas flow, and a computer for data acquisition. A working furnace will substitute heat exchangers for the insulation.

Before entering the block, the natural gas mixes with air in a controlled ratio and is preheated. When the fuel-air mixture reaches the connected pores and passageways in the block, it ignites and burns.

The energy from the gas flame heats the porous block around it. Then the block, not the flame, radiates the heat. In effect, the ceramic transforms the high-temperature flame into concentrated radiant heat.

Some advantages

In the experiments so far, the ceramic block burner achieved higher flame temperatures and remained lit with 30-percent less fuel than an ordinary flame requires. Thus the ceramic burner can burn a lean fuel-air mixture and use poor fuels such as refinery waste gas and gases containing water.

Better flame control also is claimed. Explains Ronald Matthews, engineering professor at UT, "In conventional burner design, you can try to control [residence] time and temperature using fluid mechanics, with limited results." He says, "In this burner, you control time and temperature by controlling properties or the solids, and it appears [to be] very easy."

Matthews adds, "The free flames in power plant boilers are tens or hundreds of feet long in order to get enough radiant output." But a porous ceramic burner can supply "a really high radiant output in a very small combustor."

John R. Howell, director of the center and one of the people to conceive the burner, says the emissivity increase over open flame is about tenfold.

Lower NOx

Hearing of the research, Radian Inc. funded part of the burner development and applied with UT for a U.S. patent on a low-NOx version that is staged. Combustion in this model takes place in two or more steps.

Under some operating conditions, the single-stage porous ceramic burner gives off less NOx than an open flame. With staged combustion, the researchers found they could reduce NOx emissions even further.

The two-stage burner is designed so that the fuel mixture in the first stage is hot but not sufficiently oxygenated to form much NOx, and in the second the mixture is oxygenated but not sufficiently hot.

The first two-stage burner tested out with NOx emission levels below 30 ppm. If the device can be scaled up successfully, it may eliminate the need for expensive emission-control devices such as scrubbers.

The coinventors of the low-NOx burner are Ron Bell, Radian program manager, and four members of the UT faculty—Howell, Matthews, Steven Nichols and William Gardiner.

They may test other burner block materials besides the zirconium oxide, and may also look into different block sizes and geometries.

Gas turbine usage grows

WASHINGTON—U.S. electric utilities increased their generation with gas turbine power plants in 1989 by 31 percent, from 19.1 TWh in '88 to 25.1 TWh in '89.

Operations, maintenance and fuel expenses rose correspondingly by 28 percent, from $833 million to $1.07 billion. According to the report from the Utility Data Institute, a private information services company, gas turbine generation became about twice as expensive on a dollar-per-megawatthour basis as electricity produced from coal or nuclear energy.

"Nationwide," said Liz Hannon, UDI president, "gas turbine and combustion turbine power plants annually produce about 1 percent of all electricity generated by electric utility power plants." However, she explained, while utility construction of new central station plants had "slowed to a crawl," utility orders for new gas turbine peaking plants increased significantly.

The data was based on 463 gas turbine and combined cycle plants operating in 1989, which the company estimated represented approximately 90 percent of the electricity generated by utility owned plants of these types.

Total operating capacity of the 463 power plants was 50.4 GW, an increase

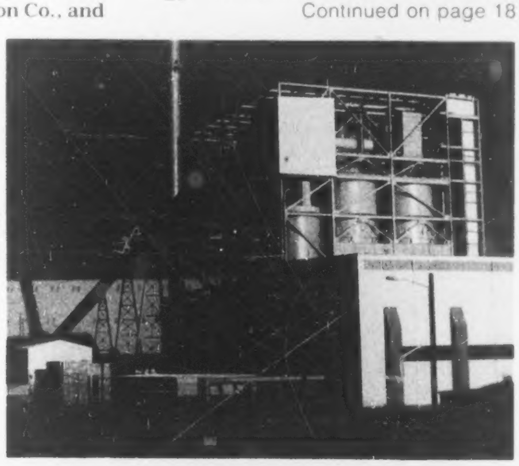
Continued on page 19

Cogen plant up and dedicated

BARRINGTON, IL—The 96-MW A.C.E. Cogeneration Project was dedicated Jan. 17 in Trona, CA, after beginning commercial operation on Nov. 2, 1990. Up to 96 MW of electrical output is sold to Southern California Edison Co., and up to 910,000 pph of steam goes to North American Chemical Co.'s Argus plant.

Claimed to be the largest coal-burning plant in the state, it is also called the

Continued on page 18



A.C.E. cogeneration plant is said to be the largest coal-fired electrical generating plant in California.

Accident followon

Kansai cleans up Mihama

BARRINGTON, IL—Work is proceeding to repair any damage and to clean up after the Feb. 9 incident at Kansai Electric Power Co.'s Mihama-2 plant in western Japan that released radioactive substances into the atmosphere (*EL&P*, 3/90, p.1, article and Late News).

Primary cooling water was drained from the 250-MW reactor cooling system on Feb. 11-12. At the same time, a leak between the primary and secondary sides was confirmed because the water level on the secondary side also dropped, to just above the half-way point.

Two television cameras were placed inside the steam generator chambers of both hot and cold sides as water was pumped into the secondary side. A leak in a ruptured tube was spotted by the cold-side camera. The failed tube was temporarily plugged, and another leak test was performed. A second leak then was ruled out.

The failed tube had been sound before the incident and had not needed any repairs previously.

Then the secondary cooling water was drained completely. A fiberoptic scope was inserted inside the damaged tube from both the hot and cold sides. In the next step, the tube will be removed and examined.

Kansai Electric stressed that although 20 tons of water had leaked from the primary to the secondary sides, most remained contained within the secondary side until drained. The drained water is in storage until it can be safely disposed of, according to Kansai.

Radioactive noble gas did escape, but the utility estimated only 0.134 curies went into the atmosphere, which is lower than its annual allowance and 8 percent of last year's normal-operation releases.

Confirming the company's assessment, the Fukui Prefectural Government and the International Trade & Industry Ministry, the national nuclear authority, declared on Feb. 12 there was no effect on the environment.

However, the country's nuclear plant guidelines were changed due to the accident to require immediate shutdown when abnormal radiation increases by 20 percent or more.

Where to find engineering info

NEW YORK—This desktop reference work for engineers explains how to solve a variety of technical problems. The *McGraw-Hill Handbook of Essential Engineering Information and Data* is filled with technical information, design methods and data for almost all engineering fields.

Practical in approach, the handbook was assembled by Ejup N. Ganic, Editor-in-Chief, and Tyler G. Hicks, Editor. It contains scores of tables, formulas, charts, diagrams and problem solutions in disciplines such as mechanical, civil, electrical, nuclear and metallurgical engineering.

Hardcover, the handbook has 1072 pages and costs $89.50.

Order from: McGraw-Hill Publishing Co., 11 W. 19th St., New York, NY 10011.

Fifth CFB shows its stuff

SAN FRANCISCO—When the circulating fluidized-bed (CFB) combustion plant near Pittsburg, CA, was synchronized with Pacific Gas & Electric's grid in December, it marked the completion of the five-plant project.

The five San Francisco Bay-area plants generate electricity cleanly and efficiently by burning fluid petroleum coke, a solid fuel byproduct of oil refinery production.

Said Frank Walton, president of Combustion Power Co., the firm that developed the particular CFB process used, "They are the first plants in the country to fire 100-percent fluid petroleum coke." The "fuel" previously was considered a waste product and disposed of as such.

Most of the combustion is confined to the fluidized bed, which operates at 1625°F. This results in 99+ percent combustion efficiency and reductions of SO_2 and NOx emissions greater than 95 percent. The combustion meets or surpasses the nation's strictest air-quality standards and is well below the standards in the new Clean Air Act Amendments.

Walton declares, "In light of the recent cataclysmic events in the Middle East, there is a desperate need for dependable, clean-burning technology to enable the U.S. to utilize alternative fuel sources." The five plants eliminate the need to import more than 1.4-million bbl of crude oil a year.

Then he adds, "The FI CIRC system can fire a wide range of solid fuels, such as petroleum coke, regular coal, coal fines, high-sulfur coal, wood waste and waste coal, in an economical and environmentally safe manner."

The fifth and newest 18.7-MW plant (same size as the previous four), like its predecessors, was developed by GWF power Systems Inc. using FI CIRC technology from Combustion Power Co.

Inside the combustion chamber of the power plant, two technicians prepare for firing the unit up to its 1650°F operating temperature.

PSI hydro unit gets overhaul

MILWAUKEE—A major overhaul of equipment was completed in mid-December 1990 at the Markland Hydro Station of Public Service Co. of Indiana. A-C Equipment Services reworked one of the three generators and Kaplan turbines, the turbine's wicket gates, and the turbine bearing guide.

Although minor maintenance is performed every three years, this was the first time since the hydro plant began operations in 1967 on the Ohio River that a unit has had a major overhaul. The work included disassembly of major components of the 27-MW generator and 41,500-hp turbine, including removal of the turbine runner assembly.

The project required a six-month outage of the units involved.

Preventive maintenance testing was performed on the stator winding and rotating field of the generator. The turbine was completely disassembled for its major overhaul. Extensive cavitation repairs were performed on the three blades of the Kaplan runner. A turbine guide bearing was rebabbited.

The turbine wicket gates were sent to the contractor's factory for repairs to the gate stems and for cavitation repairs to the blade body.

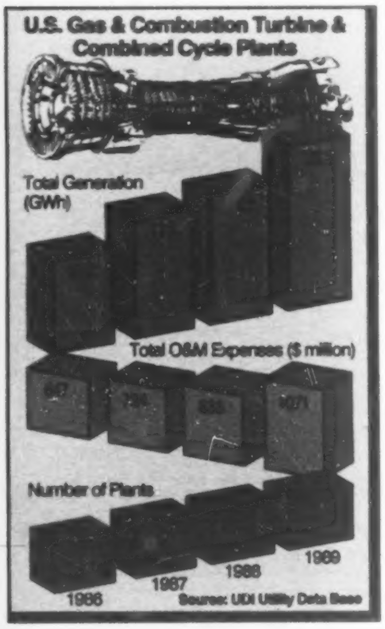
from page 17

Gas turbines...

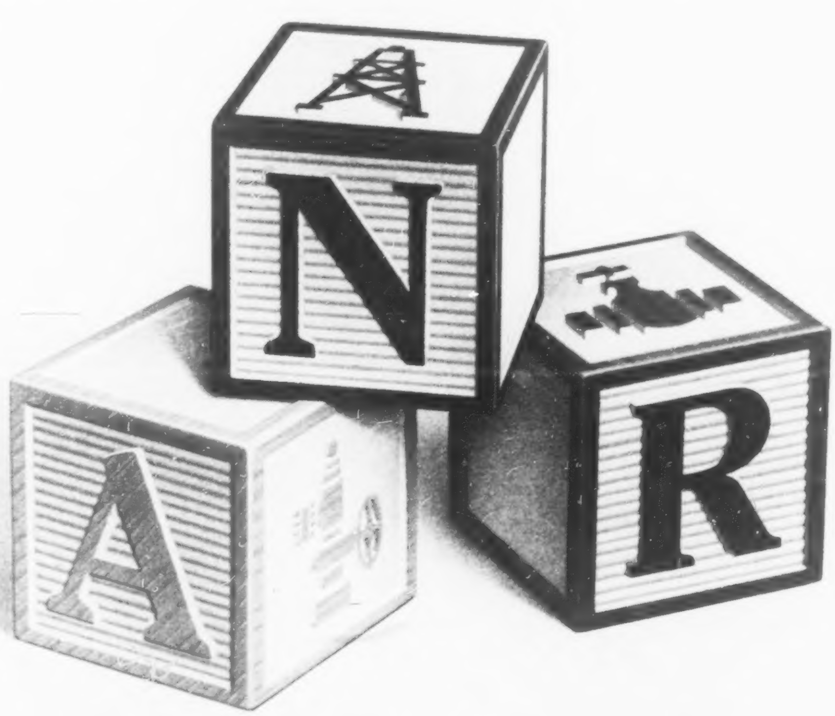
of about 4 percent in installed capacity. Capacity is broken down in the report by regions of the North American Electric Reliability Council.

Utilities spent $1.07 billion to operate and maintain the 418 plants for which both '88 and '89 production cost and generation data were available. This was a 29-percent increase. Most of this money went for fuel purchases.

For a copy of 1989 Production Costs - U.S. Gas Turbine and Combined-Cycle Power Plants, UDI-023A-90, *send $225 to: Utility Data Institute, 1700 K St., NW, Suite 400, Washington, DC 20006; or call 800/486-3660.*



NATURAL GAS FOR POWER GENERATION



ANR makes it easy as A-B-C.

ANR Pipeline Company has all the building blocks you need to make your energy-buying decisions as simple as A-N-R.® That's because we're a "full service" pipeline.

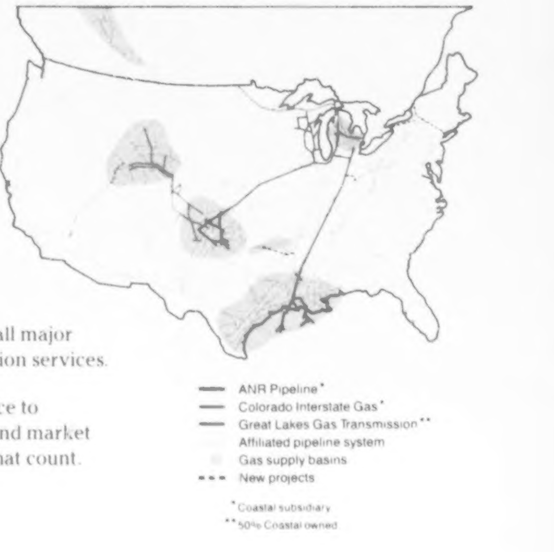
Reliable Sales: ANR offers reliability of supply and competitive pricing through its innovative sales services.

Open-Access Storage: ANR operates an extensive underground natural gas storage system that can help you reduce overall gas purchase costs and enhance supply security during peak-use periods.

Open-Access Transportation: ANR has interconnections with all major interstate pipelines and offers a variety of natural gas transportation services.

Access to every major supply basin in the U.S. and Canada. Service to customers in 39 states. New pipeline projects in growing supply and market areas. No matter how you stack it, ANR has the building blocks that count.

Give us a call or write. We're closer than you think.



ANR Pipeline Company
A SUBSIDIARY OF THE COASTAL CORPORATION

500 Renaissance Center • Detroit • Michigan • 48243 • Phone: 1-800-428-5427 (Ask for Utility Marketing Services)

Inquire R.S. 12

C 6985-6 A

ELECTRIC LIGHT & POWER

EL&P

MAY 1991
Volume 69, Number 5
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Snake River sockeye salmon was proposed "endangered;" public comment is due June 4. This and other protections may cut Northwest hydro power and hike rates.
A KPL/KG&E merger would not save money, said Kansas and Missouri regulatory staff, in recommending denial of the action.
Tri-State G&T's plan for acquiring Colorado-Ute Electric Association includes lower rates than the PS of Colorado/PacifiCorp plan.
The 1500-MW Summit pumped storage independent power project (p.12,3/91) was OK'd April 12.

Line failures darken Oahu

850,000 in a 12-hr outage; crowded beaches

Mark T. Hoske
News Editor

HONOLULU—Multiple transmission failures led to a 12-hr blackout April 9 on Oahu, served by Hawaiian Electric Co. Inc. (HECo). About 850,000 residents spent the day without power—the first total blackout since 1983. The main island has 250,000 meters.

Chris Shirai, HECo manager of system operations, explained. One of four 138-kV lines was deenergized at 7:55 a.m. for scheduled structural maintenance. At 8:23 a.m. a second line faulted on a tree and tripped. The system held stable as designed until 8:33 when a third line tripped for reasons currently being investigated. Overloaded, the final line tripped, starting an imbalance that shut down two plants and darkened the entire island by 9:07. Honolulu is the largest load center served by the big 643-MW oil-fired Kahe Power Plant, located 26 miles west of the city.

HECo started restoration in stages at 10:50 a.m. All circuits were fed and most customers restored by 8:26 p.m., but isolated outages persisted into April 10. Most businesses let out for at least an afternoon, some people spent time trapped in elevators and traffic was tight without signals. Officials encouraged people to stay off the streets and cut water use, if possible. More people than usual took to the beaches. Widespread food waste was expected from lack of refrigeration.

HECo officials said it would pay for damages if lack of "reasonable diligence and care" caused the outage. The Hawaii Public Utilities Commission also is investigating, noted Administrative Director Henry Tsuyemura, April 10.

"At this time, we don't know what might have contributed," he said. Rooting out causes and looking at system reliability could take months, he added.

Air Quality Accord tightens Canada rules

OTTAWA—As part of the Canada-United States Air Quality Accord, Canada committed to adopt more stringent air regulation.

The agreement, signed on March 13 by President George Bush and Prime Minister Brian Mulroney, binds both countries to implement current air policies, and establishes a bilateral Air Quality Committee. The committee, in part, will address transboundary issues (*EL&P*, 4/91, p.1).

Eliminates 'acid-rain menace'

"With this agreement and with the control programs now in effect in both countries," explained the Prime Minister at the signing, "we are confident that the acid-rain menace will be eliminated by the year 2000."

"Beyond our common interest in our shared environment," added the President, "this agreement says something about our overall relationship. The fact that Canada and the United States were able so quickly to craft a wide-ranging and effective agreement on such a complex subject says a lot about the extraordinarily strong relationship between

Continued on page 12

Ice storm devastates North-central Indiana grid

PLAINFIELD, IN—PSI Energy Inc. system suffered the majority of utility damage from the March 12-13 ice storm. More than 200,000 customers lost power at various utilities; nearly half the losses were at PSI.

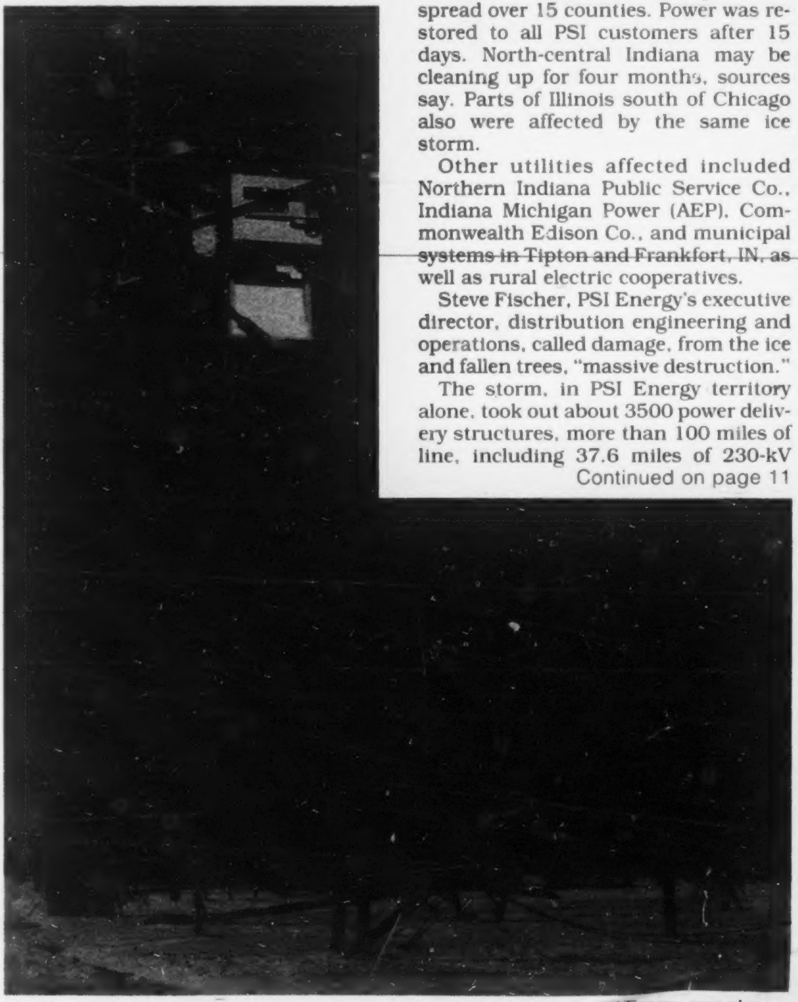
The state of Indiana sought and received federal disaster aid for 19 counties; 8 of those were in PSI territory. Within PSI territory, damages were spread over 15 counties. Power was restored to all PSI customers after 15 days. North-central Indiana may be cleaning up for four months, sources say. Parts of Illinois south of Chicago also were affected by the same ice storm.

Other utilities affected included Northern Indiana Public Service Co., Indiana Michigan Power (AEP), Commonwealth Edison Co., and municipal systems in Tipton and Frankfort, IN, as well as rural electric cooperatives.

Steve Fischer, PSI Energy's executive director, distribution engineering and operations, called damage, from the ice and fallen trees, "massive destruction."

The storm, in PSI Energy territory alone, took out about 3500 power delivery structures, more than 100 miles of line, including 37.6 miles of 230-kV

Continued on page 11



The March 12-13 ice storm took out more than 3500 poles and towers in PSI Energy area alone.

EPA may have found economical solution to PCB disposal problem

Wayne Beaty
Senior Editor-Transmission/Distribution

CHICAGO—The Environmental Protection Agency (EPA) may have accidentally discovered a safe and inexpensive way to destroy large amounts of polychlorinated biphenyls (PCBs).

EPA and others continue to research the discovery, first reported in 1987, but not widely discussed.

Then, EPA workers cleaning up an oil refinery in Indiana added quicklime to PCB-contaminated sludge to thicken it and make it easier to transport and burn. "When we came back a few months later to take samples, we couldn't find the PCBs anymore," explained Robert J. Bowden, chief of EPA's regional emergency-response branch in Chicago.

The PCBs in most samples had been reduced to a mere five parts per million from about 2000 ppm—low enough not to pose a threat to people. "In one batch, there were none," Bowden said. "This discovery could have enormous implications. Based on our research so far, it's very, very promising."

He said a similar effect has since been recorded at two other EPA cleanup sites. In addition, chemists at RMC Environmental & Analytical Laboratories in West Plains, MO, were hired to conduct independent tests that replicated the results.

The RMC tests started with samples using a synthetic soil matrix containing 4000 ppm PCBs. The tests isolated quicklime as the ingredient responsible for the destruction of the organic chlorine compounds within about 96 hrs. RMC

Continued on page 4

ELECTRICITY PRICES

	U.S. Cents per Kilowatthour		
	1980	1989	4Q89
North America			
United States*	5.29	7.64	7.56
Canada	2.9	4.8	4.9
Western Europe			
France	11.5	'88=13.1	NA
West Germany	10.0	14.2	14.8
Italy	7.1	12.5	13.3
United Kingdom	8.8	9.6	9.7
Sweden	5.9	6.6	6.8
Netherlands	11.5	'88=10.9	NA
Far East			
Australia	4.6	6.8	6.8
Japan	11.8	18.7	18.0

Note: 1988 figures given when 1989 was not available (NA). * Excluding taxes.

Source: Energy Information Administration/ International Energy Annual 1989, (available March 1,1991)

"See story p.3"

****************5-DIGIT 20814
4100127302*050191T 000000 1346
SUITE 800 COPY # 1
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

NEWS BRIEFS

JILL MINNER, Special Projects Editor

INPO gives ComEd's Braidwood top rating

The Institute of Nuclear Power Operations (INPO) has awarded Commonwealth Edison Co.'s Braidwood Generating Station an overall excellent performance, rating, Category 1, according to the utility. INPO recognized Braidwood for its team-building, aggressive problem-solving, radiation protection programs and innovative use of electronic data processing programs. Areas reviewed by INPO were: maintenance, operations, training, engineering support, radiation protection, chemistry, organization and administration, and operating experience. See related stories, p.3, 16.

UE&C opens regional headquarters in SC

United Engineers & Constructors Inc. (UE&C) said it has established a new regional management office in Greenville, SC, to direct the operations of its offices in Chattanooga, Kingsport, and Knoxville, TN, and in Winston-Salem, NC.

"We've been doing projects in the south for sixty years, and we've had offices in the region for some twenty years. As our business in the region continues to grow, we believe a strong commitment in terms of regional managment and control is certainly appropriate," explained UE&C President and CEO Charles Q. Miller.

ConEd uses coupons to educate customers about conservation

Consolidated Edison Co. of New York Inc. is encouraging residential customers to visit its conservation center by giving away compact fluorescent light bulbs. As part of its Enlightened Energy program, the utility sent customers gift certificates redeemable at the center for a free fluorescent bulb.

"The compact bulb offer was designed to provide our customers a worthwhile service while testing whether they would be willing to take time to visit the conservation center to obtain the $20-value fluorescent bulb. The response we have seen is encouraging," said Dennis P. Quirk, Con Edison vice president for energy services. Con Ed reported that so far more than 50,000 people have visited the center to collect the fluorescent bulbs.

Con Ed's program is intended to lower usage of electricity in New York City and Westchester County by as much as 15 percent by the year 2008. The fluorescent bulbs use about 75 percent less electricity and last approximately 10 times longer than standard incandescent bulbs, according to the utility.

Personnel briefs

John C. Brons has been appointed president and chief operating officer of the **New York Power Authority**. Brons, formerly executive vice president-nuclear generation, succeeds Phillip Bayne, who resigned to become president and CEO of the U.S. Council for Energy Awareness.

Madison Gas and Electric Co. has proposed that President and Chief Operating Officer Frank C. Vondrasek take over as chairman and chief executive officer when Donald J. Helfrecht retires Sept. 30, 1991. The utility also proposed that David C. Mebane, senior vice president and general counsel, fill the position of president and chief operating officer. The moves require MG&E board approval.

United Illuminating Co. President and Chief Operating Officer Richard J. Grossi has been chosen to replace George W. Edwards Jr. as chairman and chief executive officer of the utility. Edwards resigned from his position at UI to head Kansas City Southern Railway Company. Robert L. Fiscus will succeed Grossi as president and continue to serve as chief financial officer.

After a reorganization of its operating divisions on April 1, **Metropolitan Edison Co.** named Joseph B. DeAngelo to head its new Western Region and Carole B. Snyder to head the new Eastern Region.

Cooling Tower Institute's new chairman and president is Robert J. Cunningham, president of Chemisis Inc.

National Association of Corrosion Engineers president is William F. Gundaker, director of corrosion engineering at Ebasco Services Inc.

Retired Detroit Edison Chairman and CEO Walter J. McCarthy Jr. is again chairman of the **Institute of Nuclear Power Operations**.

Met-Ed welcome packet informs new customers

Metropolitan Edison Co. said it is now distributing a "welcome packet" to new customers. The packet provides information on payment programs, energy conservation programs, service interruption procedures, safety tips and advice on how to choose energy-efficient appliances. It also includes a postage-paid card for use in ordering a variety of free materials, according to the utility.

A Neighbor
You Can
Count On.

ABB forms Va. division

Asea Brown Boveri has announced the formation of ABB Power Generation's Manufacturing Division in Richmond, VA. According to the company, the new division is responsible for the components, assembly and installation services involved with ABB gas and steam turbine products for delivery in North America.

ABB said the plant, which incorporates one of the world's largest gas and steam turbine test facilities, serves ABB Energy Service Inc. and ABB Steam Power Generation Co. Thomas Astrom has been appointed vice president in charge of the new manufacturing division.

NU reaches hydro production record

Northeast Utilities reported that during 1990, above-average rainfall in southern New England boosted its hydroelectric production to a record one-billion kWh.

The output was 31 percent above average and 23 percent above the 958-million kWh recorded in 1989, according to NU. "The extra rainfall translates directly into customer savings because while we must pay for the oil, the water comes free," noted Ronald G. Chevalier, superintendent of the utility's hydroelectric facilities.

NU has 23 conventional hydroelectric sites, 14 in Massachusetts and 9 in Connecticut.

Old Consumers Power plant hits milestone

According to Consumers Power Co., its 28-year-old Big Rock Point nuclear plant has reached a lifetime net electrical output of 10-million MWh. "This production record is a major milestone for the little engine that could," said William L. Beckman, manager of the plant.

Big Rock Point, the fifth commercial nuclear plant to be constructed in the U.S., was built small to meet the needs of the U.S. Atomic Energy Commission. Consumers Power said the 67-MW plant required less fuel for tests and was less expensive and more flexible to operate than a large unit would have been. "The continued strong performance of a plant built at the dawn of the nuclear age is a great source of pride to all of us who work here," Beckman added.

Only one unit still in operation, the Yankee nuclear plant, is older than Big Rock Point, according to the utility.

APPA honors utilities for safety practices

The American Public Power Association recently presented 55 electric utilities with its 1990 Electric Utility Safety Award, at the association's Engineering & Operations Workshop in Orlando, FL.

The 193 utilities that entered were judged according to their size for the most incident-free records during 1990. Of the 55 award winners, 38 had perfect records, according to APPA.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission reported that it recently proposed the following fines:

Entergy Operations Inc.
A $37,500 fine for failure to assure the proper functioning of a safety-related system at the Waterford Steam Electric Station. The system protects control room operators from outside radiation and toxic-gas releases during an accident by monitoring the atmospheric pressure inside the control room.

Indiana Michigan Power Co.
A $150,000 fine for a violation of NRC fire protection requirements in a design modification at the D.C. Cook nuclear power station.

Northeast Nuclear Energy Co.
A $37,500 fine for alleged violations of technical specifications involving the service water system at Millstone Unit 2.

Nuclear Fuel Services
A $10,000 fine for alleged violation of NRC requirements at the company's nuclear fuel processing facility. The violation involved the transfer of radioactive liquid in amounts above procedural limits set to prevent accidental criticality.

Portland General Electric Co.
A $50,000 fine for alleged violations of NRC requirements involving medical records of licensed reactor operators at the Trojan Nuclear Plant.

Wolf Creek Nuclear Operating Corp.
A $25,000 fine for operating the Wolf Creek nuclear plant with inoperable emergency cooling pumps for at least 12 hours before the problem was discovered.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Quick and easy PCB solution—is quicklime the answer? 1
INPO helps nuclear industry surpass several 1990 goals. 3
Power delivery and supply: who's doing what, where? 8
Solar/electric races: battery advances sought. 11
Utilities unveil new demand management programs. 12
Annual reports highlight 1990. 16

GENERATION TECHNOLOGY

Japanese nuclear plant problems just seem to keep mounting up. 23
If California had more utilities like SDG&E, effect of drought would be less. 24
Fossil fuels are "old hat," but their proponents see a bright future for them. 25
Are there hot rock generating plants in your future? Maybe. 31

T&D TECHNOLOGY

Underground designs provide flexibility and reliability. 34
Long cable life can be achieved. 34

REGULAR FEATURES

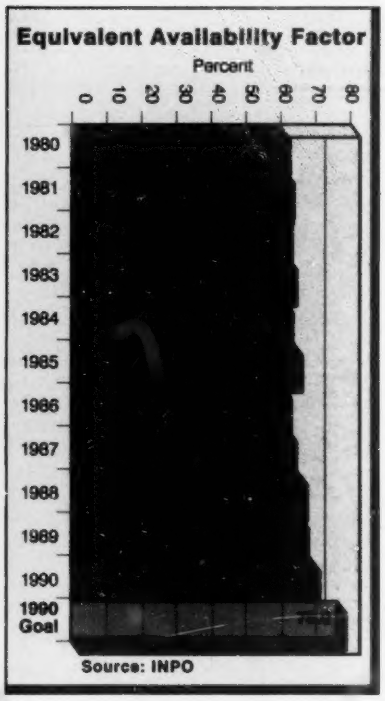
Commentary and **Letters** 4
Rate Activity 13
Labor/Management Concerns 20
Financial Performance 21
Information/Control Systems 32
Calendar 38
New Products 40
Readers' Service 43
New Literature 46
Regulatory Review 48
Management Methods 49

Coming next month:
EL&P's 26th Annual
Top 100 Report

INPO helps nuclear units surpass some '90 goals

ATLANTA—The nuclear industry improved in eight of nine performance areas in 1990, according to the Institute of Nuclear Power Operations.

Of nine 1990 goals set in 1986, five were surpassed, but four of those already had been reached in 1989. Equally aggressive goals will be set for 1995, INPO said in its annual report.



Source: INPO

Collective radiation exposure per PWR unit increased to 294 man-rem per unit, up from 292 in 1989, and short of the 1990 goal of 288. It's down significantly, however, from a 10-year high of 707 in 1981.

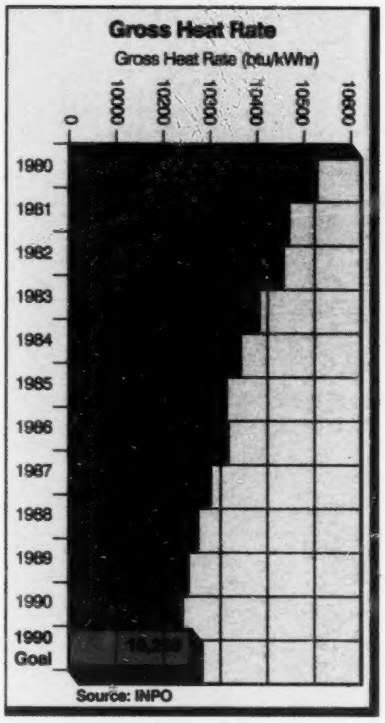
Goals surpassed

Indicators passing 1990 goals were:
- Gross heat rate (see table).
- Unplanned safety system actuations, 0.7 per unit, down from 0.9 and surpassing the goal of 0.8.
- Collective radiation exposure per BWR unit dropped to 436 man-rems per unit, down from 442, and 511 in the two previous years, better than the target of 469.
- Low-level solid radioactive waste (BWR) was 301 m^3 per unit, well below the 466 goal, which was beaten in '87.
- Low-level solid radioactive waste (PWR) was 108 m^3 per unit, almost half of the 218 goal. In 1980, it was 586.

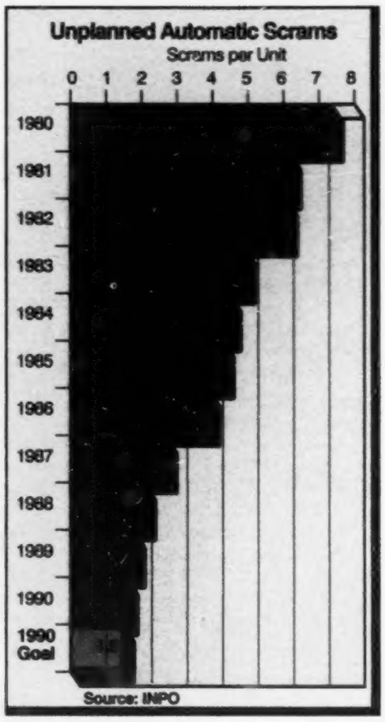
Missed goals

Indicators missing 1990 goals were:
- Equivalent availability factor and unplanned automatic scrams (tables).
- PWR radiation exposure (above).
- Lost-time accident rate, 0.22 per 200,000 man-hours worked, above the 0.19 goal, but down from a 10-year high of 1.36 in 1980.

INPO was formed by nuclear utilities to improve the safety, reliability and operations of nuclear plants.



Source: INPO



Source: INPO

North America generates most; Japan pays the most, 18.7¢/kWh

WASHINGTON—World total net electricity generation was 10.5-trillion kWh in 1988, with North American using the most, 32 percent of the total, according to the most-recent figures released by the Department of Energy's Energy Information Administration.

The U.S. generated the most, 2.78-trillion kWh of the 3.38-trillion kWh for North America.

Also in 1988, Western Europe produced 21 percent of the total; Eastern Europe and USSR, 20 percent; the Far East and Oceania, 19 percent; Central and South America, Africa, and the Middle East, each less than 5 percent of total 1988 generation.

Electricity prices in 1989 for selected countries (p.1 table), were lowest for Canada at 4.8¢/kWh and highest for Japan at 18.7¢/kWh.

World generating mix in 1988, the most recent figures available, was 63 percent thermal, 20 percent hydro, 17 percent nuclear, and less than 1 percent geothermal. Thermal was counted as coal, oil and gas. Geothermal includes other sources: solar, biomass, wind and other renewables.

Energy figures for more than 190 countries are available in EIA's "International Energy Annual, 1989," dated February 1991 and available since March 1. *Contact the U.S. Government Printing Office, Washington, DC 20402, 202/783-3238.*

SVC engineer/developer honored

STOCKHOLM, Sweden—The Swedish Association of Graduate Engineers has awarded the Polhem Gold Medal to Harry Frank, Asea Brown Boveri, for his contributions to the development of the thyristor-controlled static var compensator (SVC).

The SVC is a device that increases the reliability of modern power transmission systems by stabilizing the voltage where the supply system is subject to large load variations. It substantially reduces the capital costs to operate such systems by making it possible to increase the load on existing systems by supplying reactive power and quickly control it so that a network can be more efficiently utilized.

Once considered exotic technology, Frank's enthusiastic and reliable technical concepts succeeded in its development. To date, over 100 compensators valued at $440 million have been supplied to utilities worldwide.

The Polhem Gold Medal was instituted in 1876 to commemorate Christopher Polhem, 1665-1771, a Swedish inventor, engineer and industrialist.

Idaho beefs up energy theft program

BOISE, ID—Idaho Power investigated 238 cases of actual or suspected energy diversion in 1990, an increase of 83 over 1989. Bob Smith, IP's energy diversion specialist says, "The number of cases investigated has increased nearly fourfold in the last three years, but the company has beefed up its detection and prosecution efforts."

IP recovers about 82 percent of theft-related expenses. Cliff Harris, the company's metering specialist responsible for administering and reporting, noted the company has added a computerized program last year which greatly enhanced its ability to track violators as they move around to different parts of the company's service territory.

EC countries are expanding electric capacity but face U.S.-type problems

WASHINGTON—The 12 countries making up the European Community (EC) face the same problems as U.S. electric utilities, problems such as varying fossil fuel costs and supplies, environmental concerns, policy questions and continued uncertainty among the public about nuclear power. But they are proceeding to plan and/or build 180 new power plants of over 100 MW.

The total amount of new capacity to be added, 66.6 GW, is approximately 12 percent of current installed EC capacity. The power will come mainly from coal (36 percent of the total capacity), natural gas (26 percent), nuclear (16 percent), hydroelectric (14 percent), and oil (5 percent), according to a report from the Utility Data Institute.

By 1992, when the 12 nations will be an integrated economy, they probably will control about 16 percent of the world's generating capacity, or about 450 GW.

Utilities and non-utility generators have approximately 5500 units installed now. Of this number, NUGs (called *autoproducers* in the EC) generated about 40 GW in 1988, the most recent figures UDI has. Overall installed capacity was approximately 449.8 GW.

Unlike conditions in the U.S., NUG contributions to overall EC capacity have been declining in recent years. From 1985 to 1988, EC NUG capacity went down by about 1 GW.

In Belgium, a typical example, NUGs represented 10.5 percent of installed capacity in '76, but only 5 percent in '88, dropping from 1.2 to o.7 GW.

Two EC nations are the exceptions. A new market for utility-scale independent power producers and cogenerators is developing in Great Britain since the breakup of the government-owned Central Electricity Generating Board. And in the Netherlands, NUG capacity increased about 18 percent from 1985 to 1988.

The report, Directory of Power Plants in the European Community, *is available for $395 from: Utility Data Institute, 1700 K St., NW, Suite 400, Washington, DC 20006: 202/466-3660.*

On the matter of energy policy, the European Community (EC) has its energy trade zone plan.

The EC Commission of the European Communities (Eurecom) adopted a draft charter for an energy trade zone extending from the Atlantic Ocean to the Ural Mountains. The Eurecom plan would commit signatories to a free market in energy, covering access to and exploitation of energy resources, common investment rules, shared research and development, safety norms and environmental standards.

The proposed charter has to be approved by EC governments before an international conference could be called to discuss the details and ratify them.

Under the proposed plan, Western European countries would be able to trade investment in technology, technical expertise and infrastruture improvements for some of the Soviet Union's energy resources.

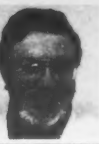
EC Energy Commissioner Antonio Cardoso E Cunha warned that the charter's success depended heavily on political conditions, particularly those between the EC and the Soviet Union.

The move is in addition to EC energy objectives promulgated in the spring of 1985 set to be in effect by 1995. Among the objectives were:
- Improve final energy demand efficiency by at least 20 percent.
- Reduce oil consumption to 40 percent of overall energy consumption.
- Increase solid fuels' share of consumption.
- Reduce electricity generated from oil and gas to under 15 percent.
- Substantially increase output from new and renewable energy sources.

Unfortunately, a followon review of these objectives by the commission concluded:
- Energy efficiency probably would not reach the 20-percent figure.
- Oil consumption would only drop to about 43 percent of overall energy consumption.
- Solid fuel usage would probably increase.
- The share of oil and gas used for electricity generation would drop to about 15 percent.
- Renewables could represent 2 percent of the total energy balance.

Further plans and actions are under review by Eurecom.

COMMENTARY



Canada/U.S. clean-air accord

At long last, the U.S. and Canada have agreed to clean up the air...on both sides of the border. As reported in our p.1 story, U.S. and Canadian negotiators have successfully completed an accord that calls on both nations to begin now to clean up air polution on a timetable running through 2010.

The agreement has been a long time in coming. First efforts were launched under the Carter Administration and renewed under the Reagan Administration. Charges of transborder pollution of Canadian air by [largely] Midwest utilities and large industrial plants were levied on U.S. negotiators. During those years, while Canada, and its Eastern provinces, pointed fingers of guilt at U.S. utilities, virtually no Canadian emission controls were applied. U.S. utilities installed scrubbers and other stack gas cleaning systems, and switched to low-sulfur coal in order to reduce sulfur emission levels, but Canadian utilities built not one scrubber or other stack gas cleaning system. Canadian stacks poured out SO_2 and NOx, unhampered.

The current accord, signed by Prime Minister Brian Mulroney and President Bush, marks a new level of statemanship. Both nations admit responsibilities and agree to deal with them. No finger pointing. No histrionics. No "holier than thou" accusations. Once again, the two nations that share the world's longest undefended border, similar standards of living and a language, have proven the power of shared common interest. The politicians have done their best. Now it's time for engineers to get on with the job that must be done.

Robert A. Lincicome, Editor-in-Chief

Three skills needed

Effective managers excel in certain skills. Three of those skills are avoiding crisis, making valid comparisons, and taking action. Employing these skills can help in almost any job, and government is no exception:

•*Avoid crisis.* Congress, the administration, democrats and republicans all deserve acclaim for resolving the recent crisis related to the railroad strike. They recognized the nature of the emerging crisis and its potential effect, prepared for it, built concensus, then waited to see if opposing sides would agree. Just 18 hours after the strike was announced, Washington averted what could have become national chaos. Amazingly, when something *really* mattered, political posturing and power brokering fell away, and the goal was accomplished. Washington proved it could act to avoid crisis...a great performance.

•*Make valid comparisons.* Is it valid to compare the performance of government and elected representatives to other organizations, free-enterprise businesses or our own work efforts? What if your company kept running in the red? What if budgets were normally submitted late...and unbalanced? What if people in your organization forgot their promises? What if they avoided risk, market opportunities, and actions of conscience and substance for fear of offending anyone?

The answers? We would be fired and/or our organizations would become non-competitive. Markets, revenues and services would decline and eventually such organizations would fold. But government seems to flourish under such conditions.

•*Take action.* The skillful leader or manager *acts*, not merely *reacts*, and is compensated for success. But Congress? Different criteria seem to apply when we decide who is compensated with our vote. Despite general discontent with Congress as a whole last fall, we reelected most incumbents handily.

This time around, we would hope that you follow closely what your elected representatives do for you, your organizations and your country. Watch C-Span, follow the news, read *EL&P*. Write letters. Ask hard questions of your representative on positions taken on issues and voting. Keep files of what your government does, or doesn't do, both for you and *to* you.

Then, if performances are business-as-usual, *USE* these three valuable skills yourself: (1) avoid crisis by (2) making valid comparisons of how things have been and should be done, then (3) take action: vote the rascals out of office.

Mark T. Hoske, News Editor

EL&P
ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher

Robert A. Lincicome
Editor-in-Chief

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
Dianne Wilson, Editorial Assistant-Products/Literature
B. J. Davidson, Bulletin Board Coordinator
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive, Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President, John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402, (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

Archeology and utilities

For a century, the practice of American archeology has been dominated by university programs. Battalions of summer diggers have mobilized annually to satisfy research models crafted by an elite cadre of university professors. The specific interests of academia have dictated which sites would be uncovered by spade and trowel. This special-interest group, until recently, dictated the major content of our nation's historical record.

Congressional passage of the Historic Preservation Act of 1966, while designed to protect antiquities, also opened the door for private sector entry into archaeological research. The Act, along with subsequent amendments, states that "the historical amd cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people." This federal response was engendered by a realization that twentieth century progress—in larger, thirst-quenching dams and longer powerline extensions—threatened to pave over, inundate or span vast chapters of the American story.

As you are well aware, this act has forced utility companies to "look below their feet" before adding new line extensions. An expanded market for archeological services has set the stage for private sector firms to compete with universities for cultural resource projects. Federal legislation has created ironic situations in the field of archeology. While construction projects destroy many historical sites in their path, private sector scientists are able to study a broader spectrum of sites that may never have been investigated by university organizations. Therefore, this new work is adding to a wider knowledge of our history.

Private sector firms, unlike many university organizations, understand the realities of business. They realize that cost conscious utility managers do not enjoy budgeting for cultural resources work. Private-sector archeologists, therefore, provide mandated services in a competitive, treamlined and cost-effective manner. As business people themselves, they are driven by the same economic realities that affect their clients. [These] private sector archeology firms can allow little quarter for dilettante, repetitive research.

Art Christensen
Consultant
Alburquerque, NM

Editor's note: Utility managers are far more concerned about such things as preservation of historical artifacts, than opponents—or reader Christensen—like to admit. But more cost-effective archeological preservationefforts as offered by private-sector organizations, as suggested, certainly should make future utility cooperation even easier to obtain.

Clarification, correction

The Mihama nuclear accident story (3/91, p.1) should have said, "...released trace amounts of radioactive substances...." To clarify, nuclear radiation is particles or energy emitted by atoms undergoing radioactive decay. A curie is a unit expressing the rate of radioactive decay.

The city of Charleston referred to (4/91, p.12) is, of course, in South Carolina, not North Carolina.

from page 1

PCB disposal solution...

also found that trace levels of certain contaminant metals in the quicklime work as catalysts in the vigorous chemical reaction that destroys the toxic material and leaves only three relatively safe byproducts—calcium chloride, water and carbon dioxide.

Details of the process at RMC are not available because the firm has filed for patent protection.

More research needed

The process is still relatively unknown outside EPA. Daniel Abramowicz, manager of environmental technology at General Electric, says he does not yet know the technical details of the process, but speculates it might be similar to GE experiments using potassium hydroxide for chemical destruction of PCBs.

Chemical Waste Management, a Chicago-based firm, is one of many looking into the process. George Vander Velde, vice president for science and technology, was quoted in Chemical & Engineering News (Mar. 18, 1991, p. 5) as saying, "Base-catalyzed dechlorination is a known phenomenon and we have such a process. But it is used in liquids, not solids. This is because EPA regulations require that PCBs concentrated greater than 500 ppm be incinerated and not stabilized, so there has not been much work done there."

Velde said Chemical Waste Management will try to duplicate EPA's results, making sure that quicklime's high heat of hydration doesn't just disperse PCBs into the air and that no hazardous byproducts are formed.

The EPA says its own laboratory in Cincinnati will begin further research, and a formal report is expected after those tests are completed. Work so far has not been subjected to peer review, and no formal report has been published in an authoritative journal.

Donald T. Sawyer, a chemist at Texas A&M University who has done extensive research on PCBs says, "I don't think enough research has been done to really be sure. Detecting the disappearance of PCBs is easy, but proving that all the chlorine became calcium chloride is difficult. Are the PCBs destroyed or just changed into molecules that are equally toxic?"

EPA's Bowden says the quicklime method costs substantially less than incineration, the most widespread and controversial method of PCB disposal. Incinerating a cubic yard of PCB-contaminated material can cost more than $500, the quicklime technique appears to cost only about $75.

The safety and cost issues of PCBs have spurred several efforts to find alternatives. For example, GE has worked with biotechnology companies to speed up "bioremediation" of a contaminated 40-mile stretch of New York's Hudson River.

The EPA said that there are indications the lime treatment may also work on other toxins such as dioxin and strong pesticides.

Firms that specialize in transformer oil-recovery systems for electric utilities are keeping a close eye on the process, but most see the process as more applicable to "superfund" toxic remediation systems than to the electric utility industry. One reviewer commented, "I wonder if this 'discovery' might be the 'cold-fusion' for PCBs?"

Meeting environmental concerns—

Does the future belong to fossil fuels?

Henry Stein
Senior Editor—Generation

Focus
Fossil Fuels

From all appearances, fossil fuels will not only remain the mainstay for this country's electric power generation, but will grow in importance, at least for the next 15-20 years.

U.S. industry (including electric utilities) has already spent more than $250 billion to reduce air emissions since the Clean Air Act was passed in 1970, according to several estimates. And that's just for starters.

Since 1975, electric utilities in this country have spent more than $100 billion just to reduce SO_2 emissions, with an annual average of $8 billion spent by coal-burning utilities alone to comply with air quality standards, notes the U.S. Department of Energy.

It's working

Results? All U.S. manmade sulfur-dioxide emissions have declined dramatically (Fig. 1), dropping by 28-30 percent between 1970 and 1988. Yet during the same period, U.S. electric utilities increased coal usage by 80 percent (highly important, since more than half the electricity generated here, 56 percent, is produced by burning coal). The decline in emissions is mainly attributed to switching to lower-sulfur coals, installing flue-gas desulfurization (FGD) systems, and cutting down on use of high-emitting plants.

In a more recent report, the EPA listed trends observed for the decade of 1980-1989 (inclusive) as reductions of:

- Twenty-four percent in SO_2 ambient levels.
- Five percent in NO_2 levels.
- Twenty-five percent in CO_2.
- Eighty percent in lead.

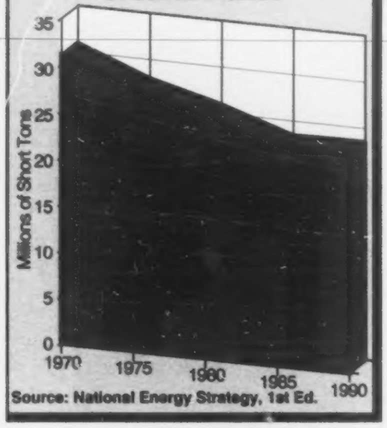
Now the Clean Air Act Amendments (CAAA) of 1990 require that utilities must reduce SO_2 emissions even more, to 50 percent of their 1980 levels by year 2000 and then be "capped" at that level, approximately 8.9-million tons per year.

Nitrogen-oxide emissions must be reduced to 2-million tons per year less than 1980 levels (Fig. 2).

In addition, President Bush's National Energy Strategy (NES) calls for changing the fuel mix for generating electricity and reducing fuel demand by about 7 quads by 2030 (Fig. 3).

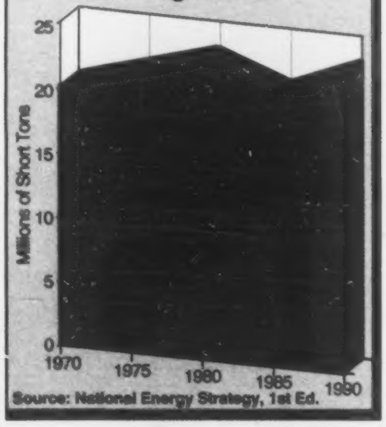
The three main fossil fuel sources are coal, natural gas and oil.

Figure 1. Emissions of Sulfur Dioxide



Source: National Energy Strategy, 1st Ed.

Figure 2. Emissions of Nitrogen Oxides



Source: National Energy Strategy, 1st Ed.

Coal

Electric power plants consume more than 85 percent of the coal used in the U.S. They produce more than 56 percent of the country's electrical energy in about 500 of the approximately 3000 power plants here. DOE predicts coal will be used to generate over 60 percent of the electricity by year 2010.

Because of this heavy usage, the NES promotes the Clean Coal Technologies (CCT) heavily by calling for their further development and new demonstration projects. It also recommends:

- Providing regulatory incentives to offset financial risks in commercial deployment of CCT.
- Allowing power plants maximum flexibility in complying with the CAAA.
- Reducing cost, investment risks and environmental impacts of producing liquid fuels from coal.
- Working much harder on reducing carbon dioxide emissions associated with burning coal.

Coal is the nation's most abundant fossil energy resource—proved coal reserves are the largest in the world. Major coal deposits are located throughout the country, with heaviest concentrations in the Southeast, Midwest and West. The eastern and midwestern states contain mainly bituminous coal; the western states, concentrations of bituminous and subbituminous coals and lignite.

Reducing emissions

Strategies for reducing emissions fall into three stages—precombustion, combustion and postcombustion.

Precombustion Stage: Plants can switch to lower-sulfur coals, natural gas or oils, or physically, chemically or biologically clean the coal by removing pollutants before it is burned. Another option is cofiring coal, and gas or oil, depending on their avaiability and cost. And interest is growing again in still another option, gasifying the coal and burning the product.

Combustion Stage: Coal burning can be modified, pollutant-absorbing substances can be injected into the combustion chamber, or the process itself can be changed to fluidized-bed combustion.

Postcombustion Stage: Devices can be installed to remove pollutants from the flue gases leaving the boiler.

Among the postcombustion systems are: particulate control systems, which include electrostatic precipitators and fabric filters; FGDs, which include wet and dry scrubbers, and ductwork sorbent injection; and various NOx reduction systems.

A unit train is loaded with "ultralow-sulfur" coal at a Sidney Coal Co. Inc. preparation center near the mine in Pike County, KY, with coal-handling facilities and preparation plant in the background. Two-thirds of the 3.5-million tons of coal produced per year here burns with less than 1 lb/MMBtu of SO_2 emissions. The preparation center shipping capacity is 10,000 tons/day; its storage capacity is 80,000 tons. (Photo courtesy of Massey Coal Co.)

When selecting an FGD method, Black & Veatch stresses consideration must be given to the space requirements of the system, disposal requirements for material created by scrubbers, need for a reagent chemical, and designs, operations and costs of the systems.

And, says David G. Arey, assistant director at Southern Illinois University's Coal Research Center, "Scrubbers work, but they are energy consumers, not generators. Scrubbers often use 5 to 10 percent of a power plant's total energy requirements."

The firm's suggestions for repowering options include fluidized-bed combustors, combustion turbines with heat-recovery steam generators or coal gasification.

Compliance strategies

John M. Wooten, vice president-Engineering & Operations Services for Peabody Development Co., recommends a seven-step compliance strategy decison-making process:

1. Identify affected units.
2. Determine amount of allocated allowances.
3. Compute allowable SO_2 emission rate.
4. Investigate compliance options.
5. Determine fuel supply contractual obligations.
6. Select a compliance strategy.
7. Obtain approval for compliance strategy.

Identifying the units is easy. For Phase I of CAAA, an affected utility generating unit is one that is 100 MW or larger and has a 1985 SO_2 emission rate greater than 2.5 lb/MMBtu. For Phase II, it is any unit with a capacity greater than 25 MW that sells one-third or more of its electrical output.

EPA estimated approximately 265 units in 110 plants in 21 eastern and midwestern states would be affected by the Phase I rule.

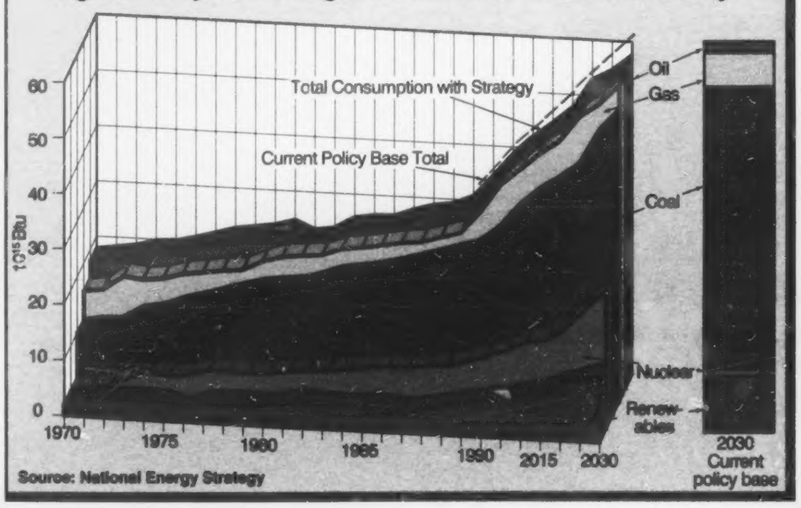
Formulas can be used to determine individual unit reductions, but then there are exceptions and special factors that must be applied, so it is advisable to work with someone thoroughly familiar with the amendments to determine the units that are affected and how much each reduction must be. The same applies to emission rates.

Wooten suggests compliance options to consider are fuel switching or blending, SO_2 removal systems, trading allowances between units, and purchasing someone else's allowances. Black & Veatch adds unit repowering and operation modification to his list.

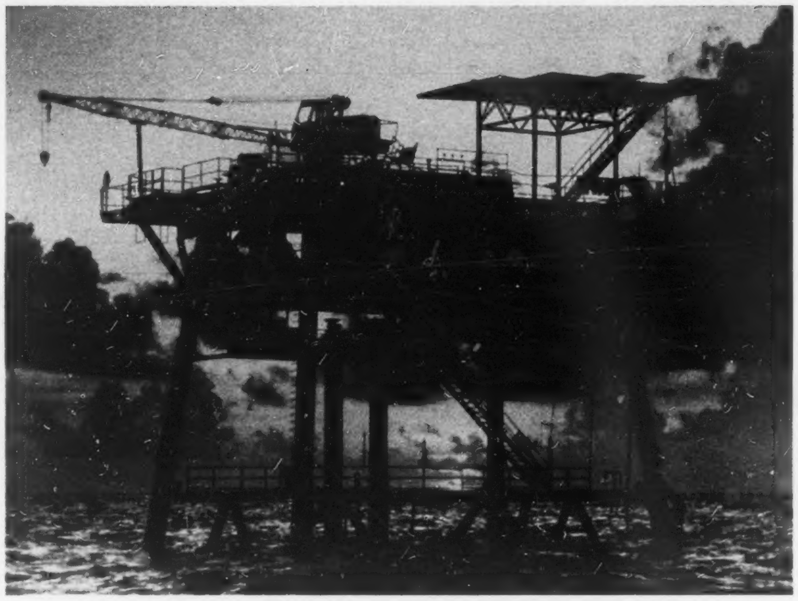
When considering fuel switching, Wooten says the plant operator should determine contractual obligations for

Continued on page 28

Figure 3. Projected Changes in Fuel Mix to Generate Electricity



Source: National Energy Strategy



Gas wells, too, are located offshore. This one draws natural gas from under the Gulf of Mexico and then pumps it ashore into the distribution system. (Photo courtesy of the American Gas Association)

fuel supply contracts in terms of both *force majeure* clauses and the right of substitution.

The sixth step, selecting a compliance strategy, involves both operational and economic considerations. Operational considerations include fuel receiving and handling, boiler configurations, fuel quality, particulate and NOx controls, and plant configuration. Economics, of course, includes taking into account both capital and operating costs.

Lastly, approvals must be obtained from both the EPA and state public utility commission.

Phase I vs. Phase II

Thomas S. Hilton Sr., vice president of Peabody, notes that in Phase I utilities may decide to switch to low-sulfur coals and thus generate excess emission allowances. The allowances could be sold or carried over into Phase II. Or, switching one unit to low-sulfur coal might provide enough excess to allow the system's remaining units to keep operating as-is.

However, Larry Metzroth of Resource Data International warns that switching coals involves more than just what goes out the stack. He lists other considerations that must be taken into account: delivered fuel price differential; precipitator efficiency; coal storage, handling and conveyance systems; coal pulverizing system; ash handling equipment and disposal; and derating costs.

In Phase II, Hilton feels very low-sulfur coal probably will be required to allow for systems' growth by year 2000. So, the very low-sulfur coals from the West may be the fuel of choice for many utilities.

He presents a few of his typical cases for different areas and conditions.

In his Eastern Coal Case, he suggests the possibility of switching to a low-sulfur bituminous coal with an SO_2 emission rate of 1.2 lb/MMBtu. His Western Coal Case relies on switching to a low-sulfur subbituminous coal with an SO_2 emission rate of 0.8 lb/MMBtu.

With plants that are reasonably close to one another, he suggests pairing them for operational, economic, contractual and/or political reasons. Then maximize the amount of high-sulfur coal that can be burned in one plant by switching the other to Powder River coal that has an SO_2 emission rate of 0.5 lb/MMBtu.

One utility's actions

In what is billed as the first major design, supply and construction contract directly resulting from the CAAA, Allegheny Power System (APS) signed with General Electric Environmental Systems to perform those duties in erecting three single-vessel FGD scrubbers and one three-flue, 1000-ft chimney at its Harrison Power Station near Clarksburg, WV. The $83-million contract is also called the first commercial contract for a utility-class, 100-percent capacity, single-tower wet FGD system in the U.S.

Site work is scheduled for the spring, with construction to begin in the fall. However, the contract is subject to change or cancellation if the APS compliance plan is not approved by the regulatory authorities.

The wet FGD systems are designed to remove 98 percent of the plant's SO_2 emissions.

A unique concept used on the project is installing one of the three absorber vessels inside the base of the new chimney—another first in the U.S.—which will further reduce space requirements and capital costs. GE installed a similar single-absorber vessel in the chimney at Stewag Mellach Station in Austria four years ago.

Start of scrubbers construction at the 1920-MW coal-fired plant is planned for this fall and will be managed by a subsidiary of United Engineers & Constructors Inc.

APS estimates it will spend about $800 million in capital costs for compliance activities. In addition to the $725 million for the three Harrison scrubbers, Phase I capital costs are to include more than $50 million for new NOx burners on boilers at four power stations and $25 million for continuous-emission monitors at 10 stations. Expected benefits include reduction of SO_2 emissions of at least 200,000 tons a year.

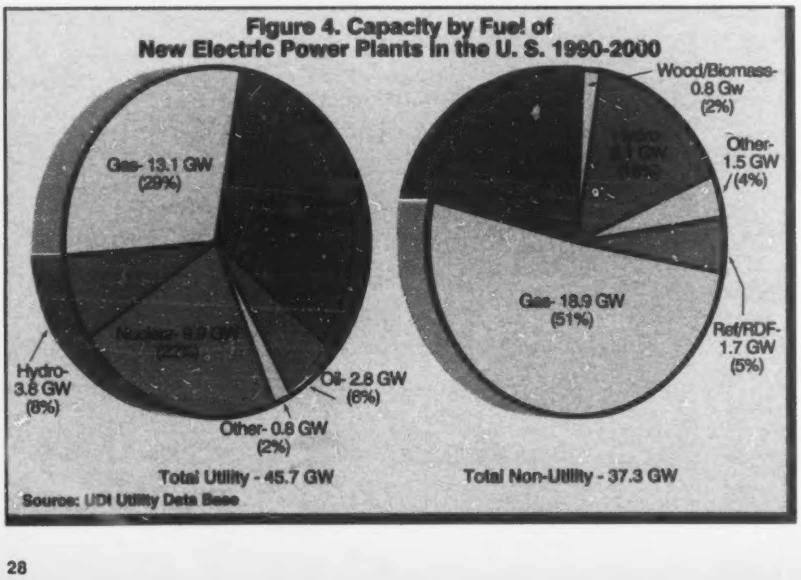


Figure 4. Capacity by Fuel of New Electric Power Plants in the U. S. 1990-2000

Source: UDI Utility Data Base

The company bases its compliance plan on engineering studies begun more than a year ago on how to most efficiently and economically reduce SO_2 and NOx emissions. The studies considered alternate compliance options, including several generating unit retirements or replacements, and adding fluidized-bed boilers, coal gasification and other technologies. Scrubbers and a switch to low-sulfur coal then got detailed technical, environmental and economic study.

For the Harrison plant, magnesium-enhanced lime scrubbing turned out to be the least-cost and best method to comply with Phase I of CAAA. And the method allows continued use of local coal, thus avoiding serious economic disruption and adverse socioeconomic effects that massive shifting to low-sulfur coal from outside the region would cause.

For Phase II, the experience gained at Harrison may be applied to the system's other generating stations, or they still might use fuel switching. Tentatively, scrubbers have been recommended for Hatfield's Ferry Power Station near Masontown, PA. Planned SO_2 emissions reductions total 193,000 tons a year for Phase II.

And what others are doing

The Southern Co. didn't wait for the "shoe to drop," either. Says Jim Stevenson, project manager for Clean Air Act compliance strategy at Southern Co. Services, "If we had, we'd be behind the eight ball right now. What we came up with should not only meet the goal of protecting the environment, but also minimize the cost to the company."

The emissions changes will cost the company up to $1 billion annually by year 2000. Most of the costs will be from reducing SO_2 and NOx at coal-fired plants throughout the Southern electric system.

Estimated compliance cost under Phase I is $30 million per year, which includes a one-time capital expense of over $100 million to modify precipitators to burn low-sulfur coal and to burn the low-sulfur coal at six plants.

For Phase II, the company forsees burning lower-sulfur coal at 11, or more, plants and installing scrubbers at up to seven plants.

Projected SO_2 reduction costs under Phase II appear to be about $1 billion annually. That amount includes capital expenditures of over $3 billion.

The Phases I and II requirements for low-NOx burners are projected to cost the company $650 million.

Natural gas

Approximately one-fourth of the energy produced in the nation comes from natural gas. Reserves are spread, but appear in large concentrations, across the country. The fuel generally is transported by pipelines to consumers.

The NES recommends removing most regulations from the natural gas industry, the exceptions being where they are necessary to protect consumers. It also proposes to increase U.S. consumption by almost 1-trillion ft^3 (about 5 percent) over and above what consumption would be without NES policies. Specifically, NES recommends:

- Expediting natural gas pipeline construction.
- Streamlining the National Environmental Policy Act process associated with gas pipeline-construction.
- Deregulating pipeline sales rates.
- Reforming pipeline rate design.
- Improving access to gas pipeline transportation services.
- Eliminating Dept. of Energy's import and export regulation.
- Encouraging use of natural gas as an alternative transportation fuel.

Importance of supplies

Gas production is expected to meet normal demand in the lower 48 states through 1991. But Calvin A. Kent, administrator of the Energy Information Administration (EIA), warns that adequate supplies will not be available after this year unless drilling is increased. Kent also warns that an exceptionally high peak day, even in 1991, along with weather-related problems, could cause temporary shortages similar to those experienced in the last week of December of '89.

He predicts gas price rises to between $1.84/$ft^3$ and $2.20/$ft^3$. The bright side to the increase is that combined with shrinking surpluses, it should spur gas drilling to meet demand.

Supplies may be tight, since one-third of new capacity scheduled by regulated electric utilities (about 13.1 GW) and one-half of new capacity currrently scheduled by non-utility producers (18.9 GW) are planned to burn natural gas to produce electricity. They will use gas turbine simple-cycle and combined-cycle plants.

Says Liz Hannon, president of Utility Data Institute, where these figures originated, "In addition to natural gas plants, regulated utilities show 10 GW of nuclear power and 15 GW of coal scheduled for service between 1990 and the year 2000. However, with several exceptions, most of the coal and nuclear capacity has been under construction for many years and, strictly speaking, does not represent 'new' capacity." (See Fig. 4.)

The NOx problem, solutions

The primary pollutant of concern from gas turbines is oxides of nitrogen (NOx), which include NO and NO_2. Other pollutant emissions are carbon monoxide (CO), unburned hydrocarbons, oxides of sulfur (SO_2 and SO_3), and particulate matter.

SO_2, unburned hydrocarbons and particulates emissions generally are neglible when burning natural gas.

Gas turbines generate NOx by two methods—fixation of atmospheric nitrogen in the flame (thermal NOx) and conversion of nitrogen chemically bound in the gas (fuel-bound nitrogen), noted Marvin M. Schorr, senior environmental engineer for GE Industrial & Power Systems, at the March American Cogeneration Association meeting in Mesa, AZ.

He pointed out that most natural gases and light distillate oils have little or no fuel-bound nitrogen, so it normally is not a consideration. That leaves at-

Continued on page 30

mospheric nitrogen as the problem.

The *rate* of generation of thermal NOx is an exponential function of flame temperature, noted Schorr, while the *amount* generated is that exponential function of temperature but also a linear function of the time the gases remain at flame temperature.

Methods to control NOx emissions from gas turbines mainly include:

- Lowering combustor temperature at the front end with diluent injection (water or steam).
- Selective catalytic reduction (SCR), a back end exhaust gas cleanup technique.
- Dry low-NOx combustors, in which GE uses staged combustion and lean fuel-air mixtures.
- Catalytic combustion systems.

Diluent injection. Injected diluent provides a heat sink that lowers the combustion zone temperature. However, as NOx emissions are decreased by this method, the added diluent causes a decrease in thermodynamic efficiency of the process and reduces parts lives.

Whether to inject steam or water usually depends on economic, not technological, considerations—Is the steam more valuable for generating electric power or for controlling the NOx emissions?

Approximately 60-percent more steam than water is needed in a natural gas-fired turbine to reduce NOx to the same level. However, steam's impact on heat rate generally is less, and steam also has a smaller impact on pressure oscillations and CO emissions than water.

Selective catalytic reduction. In the SCR process, ammonia is injected into the gas turbine exhaust gas stream to react with NOx in the presence of a catalyst to form molecular nitrogen and water. The most common catalyst used is vanadium pentoxide.

The process can remove 80-90 percent of NOx, but it requires steam or water injection to remove most of the NOx before the SCR goes to work lowering NOx levels to less than 10 ppm.

The process works best in baseloaded, combined-cycle gas turbines burning natural gas. SCR cannot be used in simple-cycle configurations without a heat-recovery steam generator to control catalyst temperature.

Care must be taken to keep unreacted ammonia out of exhaust stack emissions (ammonia "slip"). Other associated concerns are catalyst life, and costs and environmental problems of getting rid of used catalyst.

Dry, low-NOx combustors. Several turbine manufacturers have come out with dry, low-NOx combustors. They operate without the heat rate penalty and added maintenance of water or steam injection, and without the high capital investment and potential operating problems of SCR. However, some are still under development, and those in the field do not have the track record of water and steam injection.

Workers ("roughnecks") prepare to change a drilling bit at an oil well in the Peruvian jungle. (Photo courtesy of Occidental Oil Corp.)

Oil

Currently more than 200 refineries in the U.S. have a combined capacity to produce almost 16-million bbl of refined petroleum products per day. However, domestic production of crude oil fell for the fifth consecutive year in 1990, to the lowest level in 25 years. Consequently, in 1989, the most recent year figures are available from the federal government, 42 percent of the country's crude was imported. The U.S. was a net oil exporter until 1948, when consumption exceeded supply for the first time.

The NES encourages the country to become less dependent on oil. It recommends:

- Reducing impacts of oil market disruptions by increasing production in countries outside the Persian Gulf.
- Improving emergency preparedness by expanding the strategic petroleum reserve.
- Diversifying transportation fuels.
- Increasing domestic production.

On the world scene, Kent of the EIA said in February that stocks of petroleum continued to be well above the average of the past four years, despite the Persian Gulf war. As of Dec. 31, 1990, worldwide commercial stocks of crude oil and petroleum products totalled about 4.7-billion bbl, which was 205-million bbl above the four-year average level of 4.5-billion bbl. And he added only 3.1-billion bbl were required to maintain minimum operating levels.

EIA attributed the high stock levels to:

- Lower-than-expected demand due to warm winter weather, low economic growth and conservation actions.
- Increased production by Saudi Arabia and other producing countries that more than offset the loss of 4.3-million bbl/day from Iraq and Kuwait.
- Buildup of producer stocks near consuming regions in response to uncertainties before the war started.

Meanwhile, despite the relatively low price of crude oil of late, EIA also predicted U.S. petroleum consumption would decline in 1991. The organization places the reasons for this reduction on the economic recession and efficiency improvements in key petroleum sectors. In fact, net imports of oil and oil products were almost flat in 1990—demand fell by 370,000 bbl/day, or 2.1 percent.

However, more than 60 percent of the oil burned in the country is used in transportation applications, not in electric utilities. They generated only 5.7 percent of their overall electric output from oil in 1989.

Also, the EIA prediction was made before the Soviet Union announced in March that it was cutting oil exports in half. The *Wall Street Journal* reported that at the start of 1990, production in the USSR was 11.9-million bbl/day. But it fell to 10.9-million bbl/day by the end of the year. Kenneth Miller of Pervin & Gertz, an energy consulting firm, said about 2.3-million bbl/day were being exported. For now, most of the drop is being made up by OPEC countries.

Consortium to develop variable-speed wind turbine

Henry Stein
Senior Editor-Generation

BARRINGTON—The viability of using wind to generate electricity has been proven—under certain circumstances—but its more widespread usage depends on developing the technology further. Here are some of the recent advances made toward achieving that aim.

Utilities cooperate

Niagara Mohawk Power Corp., Pacific Gas & Electric Co., the Electric Power Research Institute and U.S. Windpower Inc. joined in a consortium to develop a 33-m-diam, variable-speed wind turbine that should produce power at low cost and of good quality. The five-year development project will cost about $20 million.

"This is the first time an alliance has been formed between a major wind turbine manufacturer and utility users on the East and West coasts," explained Dr. Edgar DeMeo, EPRI program manager. Thus, "What's learned can more quickly be transferred between the manufacturer and the users."

The new machine is designed to capture more energy from the wind than other types by operating at variable rotor speeds and with power electronics to optimize energy caught at both low and high wind speeds. In addition, the electronic control system reduces stress on the components, which should increase the turbine's useful life.

A prototype turbine installed at Altamont Pass in California is demonstrating an ability to reduce costs and increase energy capture. Niagara Mohawk plans to test two of the advanced-design turbines at an eastern Lake Ontario site beginning in 1992—the exact site will be selected late this year.

Vendors competing

In the world market, Danish wind turbine manufacturer Vestas-DWT and Japanese turbine builder Mitsubishi Heavy Industries are competing for dominance of the large wind machine market, that is, those with blades of 75-ft (23-m) diam and larger.

Wind Energy Weekly reports that by September 1990, Vestas had installed 470 wind turbines with blade diameters greater than 23 m, and Mitsubishi planned to have 697 in place by year's end. On the other hand, Vestas planned to have 750 of one model alone operating by the end of 1991, while Mitsubishi was not expected to add a significant number of machines this year.

The next nearest competitor, noted the *Weekly*, was Dutch manufacturer Windmaster, with less than half the turbines of either of the other two, or approximately 320.

All three companies use variable-pitch, three-bladed machines that operate at fixed speeds.

Meanwhile, the Italian energy agency ENEA and the Italian state utility ENEL plan to conduct side-by-side tests at Alta Nurra on the island of Sardinia and in the Apennine Mountains. The agency and utility will put through their paces wind turbines from Wind Energy Group (British), Vestas, Riva Calzoni (Italian) and Aeritalia Medit (Italian).

BPA looks abroad

Bonneville Power Administration is taking another route. BPA engineers and U.S. Windpower representatives are studying Windpower's experience with wind turbines in, of all places, Inner Mongolia.

The company is testing solutions to cold weather operating problems. A previous test of a turbine chilled in a fish freezing locker showed up some of its low-temperature operation shortcomings. After revising the insulation and changing to a different oil, a unit was shipped to Mongolia for outdoor testing in the extreme conditions found there.

BPA's interest is in installing wind turbines in the Pacific Northwest, in particular in Idaho, Montana and Wyoming. The engineers are concerned that the power from turbines in those states be available at Northwest peak seasons, notes the *BPA Circuit*, the organization's periodical.

Mike Berger, BPA resource planner, is quoted in the monthly as saying, "We plan things over a 20-year span. One important reason [for our interest] may be that the Pacific Northwest Planning Council has included 400 average megawatts of wind power in their draft resource plan." And one of the concerns BPA has with large-scale wind power is that turbine blades and mechanisms may not be able to withstand the combination or powerful winds and freezing temperatures in the areas.

Storing the energy

In another related development, a zinc-bromine storage battery is being developed to provide backup power during windless periods or at night for wind, solar and other generating technologies. Developed by researchers at the State University of New York, Syracuse, and the Weizmann Institute in Israel, the battery is seen as an inexpensive device for large-scale energy-storage banks.

Energy efficiency, the amount of energy stored compared to the amount put in, approaches 81 percent. Hundreds of charge-discharge cycles have had no effect on battery performance, say the researchers.

A 1-cm thick cell with an electrode area of 0.1 m^2, storing 100 Wh of electricity and routinely delivering 10 A, is operating at the Weizmann Institute.

Lead-acid batteries are not the best solution to backup power for wind and solar applications, say those at SUNY and Weizmann. The cells must be able to withstand repetitive, near-complete discharge. This type action damages normal lead-acid cells severely, and specially designed deep-discharge units are too costly for the applications. In addition, there is concern about safe disposal of the large amounts of lead if lead-acid battery usage were expanded too much.

Institute Prof. Joost Manassen estimates the zinc-bromine battery will

Continued on page 31

C6985-6A

ELECTRIC LIGHT & POWER

EL&P

JUNE 1991
Volume 69, Number 6
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Senate energy committee mark-up OK'd PUHCA reforms, nuclear plant licensing, and a "WEPCo fix." S.341 hits the floor in June; House hearings mull access.

EPA proposed rules May 20 for SO_2-emission-credit distribution, to include up to 2.8% of total credits. Comments are due in 45 days; a hearing is June 5. The auction would start by March 31, '93; the highest sealed bids win—EPA sets no minimum price, but private sellers could. EPA will sell some credits for $1500 on June 1, '93; unsold ones get auctioned. An April 24 proposed rule covers enforcement and permits.

FERC stayed the Western Systems Power Pool OK and may address members' pricing concerns (p.12). Non-utility generators may join; qualifying facilities would forfeit avoided-cost pricing.

North Korea denied U.S. satellite data showing a brief jump in ground temperatures (40°-95°F) at a small nuclear unit and continued to refuse inspections. International energy officials said the incident's probably not major.

ENSR tentatively agreed to buy PCB retrofill competitor Unison.

SCE and LADWP plan 20% cuts in CO_2 emissions over 20 years.

SoCalEd, SDG&E reject merger after state denial

5-0 vote cites competition detriment, few long-term benefits

SAN FRANCISCO—Southern California Edison Co. and San Diego Gas & Electric Co. cancelled their 2.5-year merger campaign on May 16, eight days after state regulators rejected the $2.9-billion deal by a 5-0 vote.

The utilities also dropped their merger petition to the Federal Energy Regulatory Commission. SCE's stock buyout of SDG&E would have made the largest U.S. utility—12.5-million customers.

The utilities could have asked the state public utility commission to reconsider; an appeal to the state supreme court could have followed. The utilities disagreed with the PUC, expressed disappointment, but decided to drop the matter and end the uncertainty. SCE had agreed to pay SDG&E $15 million for merger expenses. Separately, the mayor of San Diego wants reimbursement for the $6.3 million the city spent fighting the merger.

"We are persuaded that the merger *will* have adverse effects on competition in the areas of wholesale transmission and bulk power," emphasized PUC President Patricia Eckert.

"These adverse effects cannot be effectively mitigated," Eckert said.

The PUC also noted that the merged utility would be at greater risk of self-dealing; SCEcorp's Mission Energy develops unregulated power projects.

The state commission concluded that the merger wasn't in the public interest and that the amount of long-term savings wasn't substantial enough.

The two utilities expressed disappointment at the state's finding. They projected savings at $1.8 billion through the year 2000, on an estimated $100 billion in revenue.

Prior to PUC rejection, state administrative law judges (ALJ) recommended against the combination, saying only $1 billion would be saved. A FERC ALJ also recommended rejection.

SDG&E accepted a sweetened SCE offer in November 1988. The utilities extended deadlines, and expressed frustration at the length of the process. In the state proceeding alone, there were 116 witnesses, 795 exhibits, 9613 pages of transcripts and more than 3000 pages of briefs.

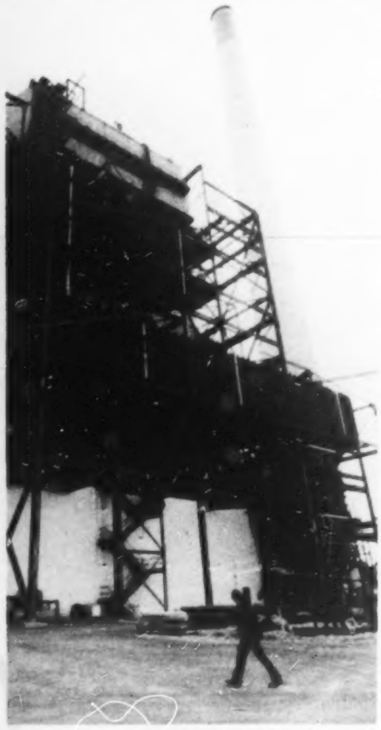
The state PUC code, amended in '89, requires short- and long-term benefits, a mechanism for consumers to reap the savings, and documentation that it causes no harm to competition. It also named seven criteria to determine if any merger is in the "public interest." Each element requires proof by a "preponderance" of evidence. Failure to meet any of these kills the proposal.

The PUC said it didn't think the amended guidelines prevented any merger, but added that "these applicants failed in their effort."

Both utilities had offered a number of other benefits and guarantees. SCE said it would make 400 MW of additional capacity available to municipal utilities, reduce overall pollution, and promised that SDG&E would not incur layoffs.

SDG&E has enjoyed stronger growth recently than its larger neighbor to the north. Without the merger, SDG&E will likely need to seek additional power supplies to meet short-term demand.

BG&E moves up service date for Brandon Shores 2



Baltimore Gas & Electric advanced the service date of the 642-MW Brandon Shores Unit 2 from March '92 to May '91 to meet growing demand. (See story, page 4.)

RESERVED FOR MAILING LABEL

Square D accepts higher buyout offer

PALATINE, IL—Square D Co. accepted a sweetened $88 per share, $2.23-billion buyout offer from Groupe Schneider S.A. on May 12, after fighting off that French company for months.

The original offer for the electrical equipment manufacturer was $78 per share in February, which Square D called inadequate. The Justice Department said May 10 that it wouldn't challenge the takeover, on anti-trust grounds.

Bid topped desire for independence

More than 70 percent of Square D shareholder had tendered shares, but the company continued to fight acquisition through a variety of legal wrangling. Despite earlier insistence that

Continued on page 6

Top 100 survey reveals 1990 was a real downer for major utilities

BARRINGTON, IL—For the third year in four, the nation's major investor-owned electric utilities suffered reduced net incomes. Common stock earnings also declined in 1990.

These are just two of the results of the 26th Annual Top 100 Electric Utilities survey, completed in mid-April.

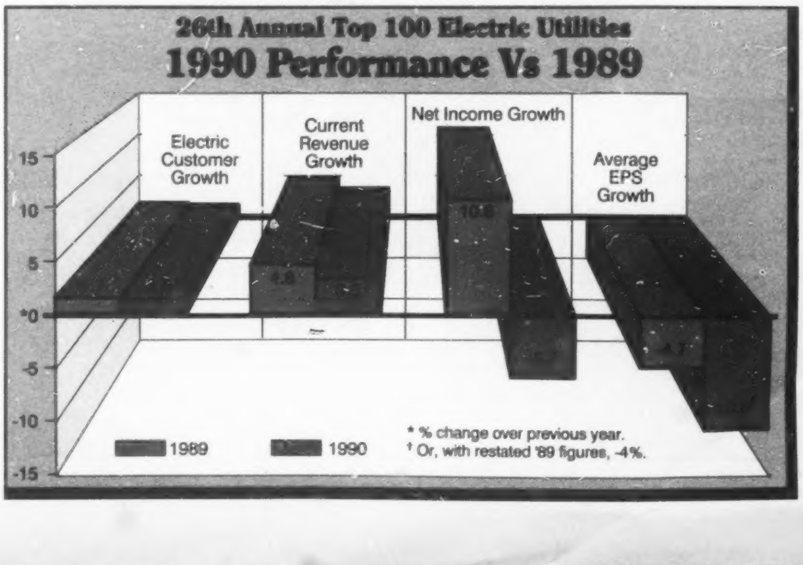
The complete Top 100 Electric Utilities report for 1990 begins on page 21

Overall, the Top 100 utilities enjoyed small gains in kilowatthour sales and revenue production. KWh sales to all classes of customers increased 2.0 percent, largely on the strength of commercial/small power sales, which increased 3.2 percent, and sales to other utilities, which gained 2.7 percent.

Average residential use fell to 9158 kWh in 1990, the second year of decline.

Revenues totalled $171.7 billion in 1990, up 3.5 percent. Of this, revenues from utility operations amounted to 97 percent of the total.

Net incomes slipped to $14 billion, down 5.7 percent, and average earnings per-share earnings dropped 4.0 percent, to $1.98.



NEWS BRIEFS

JILL MINNER, Special Projects Editor

AEP, universities point engineering students toward power industry

American Electric Power Service Corp. said it has formed an alliance with Ohio State University and Virginia Polytechnic Institute to interest electrical engineering students in the power industry. The "Alliance for Electric Power" has designed a two-part program: the Undergraduate Research Assistant Program supports students with a fellowship in power-oriented research; and the Seminar Series Program invites lecturers from each school and AEP to participate in an information exchange.

EEI distributes utility conservation poster, info kit to schools

A poster depicting utilities' conservation efforts and a packet of stories on environmental issues from national publications are being distributed to schools by the Edison Electric Institute through its High School Grant Program. EEI hopes to heighten awareness of the programs utilities have undertaken to restore, enhance or protect the nation's land and water resources. The poster depicts some of these programs, such as artificial wetlands development, fish restocking and recreational uses.

Personnel briefs

Larry D. Haab was appointed president and chief executive officer of **Illinois Power Co.** Haab has served as president and chief financial officer of the utility since April 1989. He replaces Wendell J. Kelley, who retired June 1.

Upper Peninsula Power Co. Vice President-Administration Clarence R. Fisher was named president, chief operating officer and a director of the company. Fisher succeeds Elio Argentati, who will continue to serve as chairman of UPPCo and chairman and president of UPPCo's parent company Upper Peninsula Energy Corp.

Clarence Fisher

John MacFarlane, president and chief executive officer of **Otter Tail Power Co.**, was appointed chairman, replacing Bob Bigwood, who has retired.

Central Illinois Light Co. has named R. Wayne Slone chairman of the board. He succeeds Robert O. Viets, who is president and CEO of the utility's parent company CILCORP.

Ronald J. Binz will take over as president of the **National Association of State Utility Consumer Advocates.**

UI says conservation program exceeded goal

The United Illuminating Co. (UI) reported that the first-year results of its three-year, $35-million investment in conservation and load management surpassed expectations. UI kicked off 13 different kilowatt- and kilowatthour-saving programs in 1990, which together exceeded the company's goals by 37 percent.

"UI aggressively pursues the installation of cost efficient energy conservation measures, and our work is paying off," stated UI Director of Marketing Tony Vallillo. "These initial results suggest that our investments in conservation will have as real a payback as investment in new generating plants. This is especially important as conservation and load management are increasingly viewed as vital elements of UI's future fuel mix."

NRC proposes changes to licensing fees

The Nuclear Regulatory Commission has proposed revisions to its licensing, inspection and annual fee schedules, that would result in a substantial increase to fees currently charged and would impose fees on many organizations that currently do not pay them. The NRC said the changes are necessary to recover approximately 100 percent of its Fiscal Year 1991 budget, as required by the Omnibus Budget Reconciliation Act of 1990.

According to the commission, the proposed revisions include a $1.8-million increase in the amount of annual fees assessed against operating power reactors, and the assessment of fees for the first time for fuel fabrication facilities, independent spent fuel storage facilities, uranium mills, transportation certificate holders and hospitals, doctors, irradiators, nuclear gauge users and other nuclear materials licensees.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission reported that it recently proposed the following fines:

Carolina Power & Light

A $50,000 civil penalty for alleged failure to comply with NRC requirements at the Brunswick nuclear power plant. The NRC said the violation was the result of a failure to follow procedures while performing a calibration test of a process computer point on the feedwater control system. The test was performed when the reactor was operating at 100 percent power, when procedures state it should only be performed in cold shutdown or during refueling.

Commonwealth Edison

A $100,000 fine for violation of safety requirements involving a potential leakage path from the reactor containment at Unit 2 of the Dresden nuclear power station.

Georgia Power

A $50,000 civil penalty for alleged violation of NRC requirements at the Hatch nuclear power plant. The proposed fine relates to a review of radiation protection activities associated with a traversing incore probe event on Feb. 11, 1991, which NRC inspectors said created a substantial potential for a radiation overexposure to certain plant personnel.

TU Electric

A $50,000 fine for apparent violation of NRC requirements in some aspects of the fire protection program at the Comanche Peak Steam Electric Station. The NRC said it cited the utility because employees of a TU contractor hired for fire watch patrols falsified records to show that they inspected assigned areas at one-hour intervals when, in fact, they had not done so.

Difference grows between most and least expensive summer rates

Twelve Most Expensive Companies

Company Name	State	Avg. Cost Cents/kWh	Summer 1990 National Rank
Long Island lighting Co.	New York	$0.148	1
Consolidated Edison Co. of N.Y.	New York	$0.146	2
Philadelphia Electric Co.	Pennsylvania	$0.139	3
Commonwealth Edison Co.	Illinois	$0.137	4
Iowa Electric Light & Power Co.	Iowa	$0.135	5
Orange & Rockland Utilities	New York	$0.133	6
Nantucket Electric Co.	Massachusetts	$0.132	7
Toledo Edison Co.	Ohio	$0.131	8
Hawaii Electric Light Co.	Hawaii	$0.131	9
Pennsylvania Power Co.	Pennsylvania	$0.126	10
Duquesne Light Co.	Pennsylvania	$0.126	11
Cleveland Electric Illuminating	Ohio	$0.125	12

Twelve Least Expensive Companies

Companies Name	State	Avg. Cost Cents/kWh	Summer 1990 National Rank
Washington Water Power Co.	Idaho	$0.042	188
Pacific Power & Light Co.	Washington	$0.043	187
Washington Water Power Co.	Washington	$0.044	186
Idaho Power Co.	Oregon	$0.047	185
Idaho Power Co.	Idaho	$0.047	184
Portland General Electric Co.	Oregon	$0.049	183
Kentucky Utilities Co.	Kentucky	$0.050	182
Montana Power Co.	Montana	$0.051	181
Minnesota Power & Light Co.	Minnesota	$0.052	180
Kingsport Power Co.	Tennessee	$0.054	179
Puget Sound Power & Light Co.	Washington	$0.054	178
Nevada Power Co.	Nevada	$0.055	177

Source: National Association of Regulatory Utility Commissioners

The difference between the most and least expensive rates in the country widened last summer, according to the National Association of Regulatory Utility Commissioners' survey of residential electric bills. The spread was more than 10.6 ¢/kWh, or 2.5-times the lowest rate. A year ago the spread was just 1.3-times the lowest rate.

The survey, taken during June, July and August of 1990, showed that the difference between the highest and lowest rates surged from the summer of 1989. The nationwide average cost of electricity was 8.7 cents per kWh in 1990, an increase of 0.4 cents, or 5 percent, from 1989, according to NARUC. The study reported average customer use of 500 kWh per month.

A comparison of regions shows that the Northeast and New England had the highest average electric bills, while the Northwest and Rocky Mountain regions had the lowest average bills. Once again customers in Lewiston, ID, served by Washington Water Power Co., paid the lowest rate for electricity—about 4.2 ¢/kWh, while Long Island Lighting Co. customers in Long Beach, NY, paid the highest rate of 14.8 ¢/kWh.

In its report, the commission noted that simple kWh comparisons may not accurately reflect the true cost of electricity to retail customers, due to the use of energy conservation or demand-side management programs.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

26th Annual Top 100 Report reveals problems that make 1990 a year many CEOs would like to forget. 1, 21
Mergers: Calif. denies SCE/SDG&E, NU readies for PSNH acquisition. 1,3
NERC examines clean-air, non-utility generator reliability effects. 3
FERC wants to talk to you about something. 4
NY Power Authority expands employee degree program. 8

GENERATION TECHNOLOGY

Detroit Edison retubed the condenser at Fermi-2 to prevent possible contamination. 26
The Chernobyl accident caused the world to help the Soviets prevent repeats. 26
How do you protect permafrost when a power plant is sitting on it? 26
Low-ranked coal may be usable, economically, if this process proves out. 29

T&D TECHNOLOGY

Reliability indices may be outdated. 32
Advance weather data helps utility planners. 32
Meter testing: single-phase or three-phase? 32
Mobile substations decrease in size but not performance. 34
DA project bridges gap between real-time data and AM/FM. 39

REGULAR FEATURES

Commentary and **Letters** 4
Rate Activity 13
Calendar 14
Labor/Management Concerns 16
Marketing 18
Financial Performance 25
Information/Control Systems 40
Regulatory Review 41
New Products 44
Bulletin Board 47
Readers' Service 51
Management Methods 57

COMMENTARY

Time to do something about serious signs of the times

The disappointing performance of the Top 100 Electric Utilities in 1990 is the sort of thing that makes headlines. It fuels impassioned speakers' pleas for changes in rates or operating procedures to help the industry.

Unfortunately, neither are likely to do much good fo~~r~~ the utilities that need relief the most.

Collective poor utility performances, like a flu epidemic, can't be treated effectively except on an individual basis. While some utilities may be very sick financially, neighboring utilities may enjoy considerable good health. Viruses and germs may be all about us, but they don't necessarily effect everyone the same. Ditto for utilities and their problems.

It isn't unusual for an electric utility to have an off year every so often...to run into combinations of conditions that slow growth, or even reverse it in one or more areas...for a short period.

But when large numbers of utilities suffer reverses...then follow one poor year's performance with another even-poorer performance, strong medicines are called for. Such is the case indicated by this year's Top 100 report.

KWh sales growth barely surpassed the rate of customer increase, and average residential use actually declined, reflecting both the mild weather conditions that prevailed throughout much of the year in most parts of the country and the effects of conservation efforts. Low load growth and fewer, smaller rate increases led to only a small increase in revenues, overall. Collective net income fell. Most seriously, share earnings tumbled for the second straight year.

Despite what some commissions and consumerism fanatics believe, withholding rate relief to needy electric utility organizations will benefit customers only in the very short term. Longer-term, financially strong electric utilities, and *only* financially strong electric utilities, can provide reliable electric service, at favorable rates.

Customers need adequate and reliable electric supply, utilities need reasonable and fair rates and providers of capital need a realistic return. The only real solution is for utility managements and regulators to be able to sit down and discuss developments affecting utilities, and how best to accommodate them while still protecting the environment and consumers interests.

That will require all sides to go beyond we-them attitudes, finger pointing and gross accusations about the past, and will take hard, open negotiation to optimize future actions. Political posturing must be eliminated and actions focused on realistic long-term planning...not easy, but long overdue.

Robert A. Lincicome, Editor-in-Chief

FERC seeks input on present, future

WASHINGTON—Federal energy regulators want *you*...to comment on the current state of and future direction for the electric utility industry.

The Federal Energy Regulatory Commission—for a June 18 public conference—invites representatives from utilities, state regulatory commissions, federal agencies, consumer groups, public power groups, cogenerators and any others, to "express their views on the future regulation of electricity markets at the federal level and interaction of this regulation at the state level."

FERC will accept written comments, and requests to participate for an extended period, until June 10. The deadline for comment and participation was extended from May 15.

The commission said that "rapidly emerging changes in the industry," such as independent and affiliated power producers and marketers, increased competition, reorganizations and mergers mean "it is an appropriate time to provide for public discussion of major issues affecting the electric industry and consumers."

FERC also cited the impacts of Clean Air Act Amendments, the National Energy Strategy, and other issues raised by state regulators and the industry as the reason for the conference.

Requests to participate and comments should be filed separately to FERC's Office of the Secretary, 825 N. Capitol St., NE, Washington, DC 20426, 202/208-0200.

EL&P ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice, Publisher
Robert A. Lincicome Editor-in-Chief

PennWell PUBLISHING COMPANY
708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
Dianne Wilson, Editorial Assistant-Products/Literature
B. J. Davidson, Bulletin Board Coordinator
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402; (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101

BPA ABP Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

UG power delivery

I read, with great interest, articles in the April issue of *EL&P* about underground power delivery. I was disappointed that the historical perspective by T. A. Balaska left out information about who invented underground cable—Thomas A. Edison—according to the U.S. Patent Office.

In Dec. 1880, Edison's men completed an underground power distribution system for the Menlo Park, NJ, laboratory. Edison filed for a basic patent on underground cable on April 22, 1881, and received Patent No. 251552 on Dec. 27, 1881. A considerably more significant contribution to underground practices was a patent filed in 1880 (and granted in 1884) that defined the principles of feeder and mains distribution.

Bob Landman
H & L Instruments

P.S. In the January 1991 issue, in the 1991 forecast, you had several news items pertaining to fiberoptics (note that we prefer the one word, as do some of the optics journals). I am unfamiliar with the IEEE groups and would like to know who to contact in the Fiberoptics subcommittee, the PES Communications committee and the New Concepts subcommittee. Would you please give me names and phone numbers as I would like to join these groups.

Editor's note:

For the benefit of reader Landman, and other readers as well, here are the names and addresses of the requested committee chairpersons at IEEE: Power System Communications Committee—G.L. Nissen, Los Angeles Department of Water & Power, 1216 W. First Street, Los Angeles, CA 90026; New Concepts Subcommittee—W.P. Malcolm, Electric Power Research Institute, 3412 Hillview Ave., PO Box 10412, Palo Alto, CA 94303; Fiber Optics (sic) Subcommittee—R. Whapham, Preformed Line Products, PO Box 91129, Cleveland, OH 44101.

High reliability

The January 1991 edition of your publication had an article titled "Lilco-baseload steam marks reliability high." Long Island Lighting Co.'s reported baseload steam unit forced-outage rate of 1.93 percent for the 12 months ending September 1990 is certainly a noteworthy achievement. However, we at Hawaiian Electric Co. have recorded a forced-outage rate for our baseloaded steam units of 1.76 percent for the year 1990.

Unfortunately, this was almost double the forced-outage rate of 0.89 percent experienced in 1989.

Over the past five years, we have enjoyed forced-outage rates on our baseloaded steam units that range from a low of 0.39 percent in 1986 to a high of 2.17 in 1987:

Year	EFOR
1986	0.39%
1987	2.17%
1988	1.61%
1989	0.89%
1990	1.76%

This remarkable record is the combined forced-outage rate of our eight baseloaded steam units that range in size from 90 MW to 144 MW.

David M Rodrigues
Vice President-Operations
Hawaiian Electric Co.
Honolulu, HI

Editor's note:

HECo certainly is to be congratulated on its operational record. Obviously the company's insular location demands a very high level of engineering and maintenance effort, which certainly is documented by its low forced-outage record.

Maine Yankee expects May restart after April 29 non-nuclear fire

WICASSET, ME—Maine Yankee nuclear plant operators expect the plant will restart by the end of May, after an April 29 fire.

Plant officials say the force of a power transformer explosion ruptured hydrogen cooling lines to the generator, and caused a surge in a neutral connection to the generator that then ignited a hydrogen fire.

The 345-kV, 430/481 MVA, transformer was replaced with a spare, and fire damage repaired. Maine Yankee's investigation into the transformer-failure cause continues.

No significant damage was done to the plant generator. The fire caused the turbine to trip almost immediately. The reactor shut down automatically as designed, at 6:32 p.m. The fire was controlled shortly, but wasn't extinguished until 10 p.m. when the turbine hall was flooded with CO_2 to smother flames.

"When you've got hydrogen and electricity in the same area, you don't want use a lot of water to put out a fire," said a plant spokesman.

Plant workers, contractors, the Coast Guard and Maine environmental officials had to clean about 200-gal of PCB-free oil that spilled from the transform-

Continued on page 8

BG&E hurries coal unit construction

BALTIMORE—Slower demand growth delayed this power plant by 13 years, but renewed customer demand now has advanced the new service date for Unit 2 by 10 months (see photo, p. 1).

Baltimore Gas & Electric Co. planned to start operation of Brandon Shores Unit 2 in late May, 10 months earlier than previously expected - because of growing customer demand.

The utility's supervision of on-site construction contributed to budget cuts of approximately $43 million, for the $670-million unit.

BG&E originally planned two oil-fired Brandon Shores units for operation in 1977 and 1978. Readjustment in demand curves, and fuel supply, postponed unit one until May 1984 and prompted a switch to coal-firing, with an electrostatic precipitator.

The seven-year wait for Unit 2 allowed design and equipment upgrades including automation/controls, coal handling, boiler, and cooling tower. Equipment suppliers included: Gilbert/Commonwealth Inc., Babcock & Wilcox Co., General Electric Co., Westinghouse Electric Corp., Foster Wheeler, Zurn Constructors, and Bailey Controls.

Rates increased $124 million in May, but the fuel rate fell by $52 million.

26th Annual Top 100 Electric Utilities Report

1990 was no picnic for major electric utilities

The nation's largest investor-owned electric utility companies posted expected increases in customers served, kWh sales and revenues. But net incomes and earnings-per-share dipped. It wasn't a great year!

Robert A. Lincicome
EL&P Editor-in-Chief

For the top managements of a majority of the nation's largest investor-owned electric companies—the Top 100 Electric Utilities— 1990 was a year they would just as soon forget. It was anything but good.

Performances during the year were mixed, but where positive gains count most—net income and earnings per share of common stock—the year was terrible. Last year, we reported that 1989 performance figures masked serious problems for the Top 100. This year's figures reveal just how serious those problems have become for major electric utilities companies.

Sales, revenues up, but...

Customers served, kilowatthour sales and revenues all were up in 1990, but by smaller percentages than during 1989.

The Top 100 served 83.3-million electric customers in 1990, which represented an increase of 1.5 percent. In 1989, customer growth was 1.7 percent. At the same time, the number of gas customers served by the Top 100 electric utilities rose by 1.8 percent. A total of 47 electric utilities also provide gas service.

Kilowatthour sales to all customers rose by 2.0 percent, to a record 2.3-trillion kWh. By way of comparison, kWh sales in 1989 grew by 2.6 percent, a rate lower than in the previous several years. Growth in kWh sales averaged just 2.7 percent per year over the previous five years.

Especially worrisome were residential sales, which only edged up by 1.5 percent in 1990, the same increase as reported for the number of customers added. In other words, actual customer usage did not increase at all, but actually declined slightly. The decline was less than 1 percent, however.

Naturally, increased kWh sales produced increased revenues...to a record $171.7 billion. But the increase, 3.5 percent, lagged 1989's increased performance by 27 percent.

...income and earnings fell

Net income available for common shares, after taxes and provisions for preference stock, fell again, for the third consecutive year and the total was well below the current record income posted in 1984. The decrease from 1989's $14.9-billion income was 5.7 percent. In 1984, for comparison, net income for the Top 100 was reported to be $16.7 billion, which still stands as a Top 100 record.

Per-share earnings for common stockholders fell 4.0 percent, to an average $1.98 per share. While just eight companies had negative earnings, or deductions from equity, only 50 companies posted positive gains; the remaining 42 had earnings that were equal to or less than a year earlier.

The lackluster performance is hurting utilities in the financial market today as many analysts, brokers and dealers are advising clients to stay away from utility stocks, which they see as continuing to underperform the balance of the market.

External forces pressure utilities

The difficulties utility managements encountered in 1990 were largely beyond their control. First, there were problems of the developing recession, especially with reductions of activities in the manufacturing sector of the economy. Then temperatures in most parts of the country were milder than normal, resulting in lower kilowatthour usage by consumers, and lower revenues for utilities.

The effects of these two factors were exacerbated by recalcitrant state utility commissions that continued to maintain their punitive attitudes toward various utilities with nuclear projects, as well as to rate requests in general.

Milder weather and the effects of the recession combined in 1990 to reduce the rate of kilowatthour sales growth. In 1990, total sales climbed just 2 percent, to 2.288-trillion kWh.

The 2.0-percent kWh sales increase in 1990 rate compares with a sales growth rate of 2.6 percent a year earlier and reflects a continued slide back to the kWh sales growth rates of the post Oil Embargo period. The 1990 sales growth rate is less than half the rate realized just two years ago, when it hit a post-Embargo high of 5.3 percent.

The 2.288-trillion kWh amount sold in 1990 was another record, however, as expected.

Milder temperatures tempered customer use of electricity during both peak winter and summer periods in 1990. Sales to customers in nearly all classes fell late in the year, compared with sales increases brought on by exceptionally cold December weather in 1989.

However, there were compensating differences. Revenues for a cold-spell that stimulated December 1989 sales showed up as 1990 revenues, which provided a welcome boost.

Actually, kWh sales to two classes of customers edged higher in 1990, while they fell for two other classifications of customers.

EARNINGS TABLE

Company	Rank	% Change From 1989	1990 Earnings Per Share,$	1989 Earnings Per Share,$
Portland General*	1	474.14	2.17	-0.58
Boston Edison	2	328.41	2.01	-0.88
Long Island Lighting	3	256.29	2.36	-1.51
Entergy*	4	205.63	2.44	-2.31
United Illuminating	5	160.48	3.55	-5.87
Pinnacle West Capital*	6	117.61	1.12	-6.36
Northern Indiana Public Service	7	81.00	1.81	1.00
IE Industries*	8	77.49	4.10	2.31
New England Electric*	9	74.15	4.11	2.36
El Paso Electric	10	71.34	-0.96	-3.35
Illinois Power	11	64.75	-1.53	-4.34
Kansas Gas & Electric	12	47.06	2.00	1.36
SCANA Corporation* (SCE&G)	13	46.05	4.44	3.04
LG&E Energy Corp.*	14	34.69	4.31	3.20
Washington Water Power*	15	28.15	3.46	2.70
Montana Power Co.	16	26.90	1.84	1.45
Detroit Edison	17	23.02	3.26	2.65
Central & South West*	18	16.62	3.79	3.25
Wisconsin Power & Light	19	15.54	2.23	1.93
Puget Sound Power & Light	20	14.89	2.16	1.88
Orange & Rockland Utilities	21	12.74	3.54	3.14
San Diego Gas & Electric	22	11.75	3.52	3.15
Southwestern Public Service	23	11.43	2.73	2.45
Oklahoma Gas & Electric	24	10.82	3.38	3.05
Pacific Gas & Electric	25	10.53	2.10	1.90
DQE*	26	10.34	2.24	2.03
KPL Gas Service	27	9.76	2.25	2.05
Southern Indiana Gas & Electric	28	7.47	3.02	2.81
Dominion Resources*	29	5.80	4.38	4.14
Union Electric	30	4.98	2.74	2.61
Madison Gas & Electric	31	4.79	3.06	2.92
Utilicorp United	32	4.41	2.13	2.04
Central Hudson Gas & Electric	33	4.39	2.38	2.28
Central Louisiana Electric	34	4.23	3.70	3.55
TECO Energy*	35	3.81	2.45	2.36
Carolina Power & Light	36	3.81	4.36	4.20
Otter Tail Power	37	2.58	1.99	1.94
Empire District Electric	38	2.30	3.12	3.05
DPL*	39	2.29	2.23	2.18
Pacificorp	40	2.21	1.85	1.81
Public Service of New Hampshire	41	1.78	-4.98	-5.07
Duke Power	42	1.69	2.40	2.36
IPALCO Enterprises*	43	1.57	2.58	2.54
St Joseph Light & Power	44	1.22	2.48	2.45
Southern California Edison*	45	1.12	3.60	3.56
Northeast Utilities*	46	1.04	1.94	1.92
Wisconsin Public Service	47	1.01	2.00	1.98
Gulf States Utilities	48	1.00	-0.99	-1.00
CIPSCO Inc.*	49	0.52	1.92	1.91
General Public Utilities*	50	0.20	5.02	5.01
Centerior Energy*	51	0.00	1.90	1.90
Iowa Southern*	52	-0.28	3.54	3.55
Texas Utilities*	53	-0.90	4.40	4.44
New York State Electric & Gas	54	-1.98	2.46	2.53
Public Service Enterprise Group*	55	-2.29	2.56	2.62
Pennsylvania Power & Light	56	-2.47	3.95	4.05
Allegheny Power System*	57	-2.96	3.61	3.72
Green Mountain Power	58	-2.97	2.29	2.36
TNP Enterprises* (Tex NM Power)	59	-3.16	1.84	1.90
Wisconsin Energy*	60	-3.82	2.77	2.88
Public Service of Colorado	61	-3.86	2.49	2.59
Cincinnati Gas & Electric	62	-5.07	4.12	4.34
Public Service of Indiana	63	-5.17	2.20	2.32
Iowa-Illinois Gas & Electric	64	-5.24	1.99	2.10
Consolidated Edison	65	-6.02	2.34	2.49
Kansas City Power & Light	66	-6.04	3.11	3.31
Central Vermont Public Service	67	-6.18	2.43	2.59
Interstate Power	68	-6.23	2.56	2.73
Central Maine Power	69	-12.50	1.68	1.92
Northern States Power	70	-12.65	2.83	3.24
Kentucky Utilities	71	-15.09	1.97	2.32
Rochester Gas & Electric	72	-18.10	1.72	2.10
Minnesota Power	73	-18.28	2.37	2.90
American Electric Power*	74	-18.46	2.65	3.25
Atlantic Energy*	75	-19.25	3.02	3.74
Idaho Power	76	-19.41	1.91	2.37
Houston Industries*	77	-19.58	2.67	3.32
Bangor Hydro-Electric Company	78	-20.42	1.52	1.91
Ohio Edison	79	-23.39	1.67	2.18
MDU Resources Group	80	-24.34	1.43	1.89
Cilcorp*	81	-24.86	2.69	3.58
Potomac Electric Power	82	-25.00	1.62	2.16
Southern Company*	83	-28.73	1.91	2.68
Midwest Resources Inc.*	84	-30.56	1.25	1.80
Baltimore Gas & Electric	85	-31.15	2.10	3.05
Hawaiian Electric*	86	-33.99	2.02	3.06
Commonwealth Energy System*	87	-47.83	2.16	4.14
Eastern Utilities Associates*	88	-48.14	1.53	2.95
Nevada Power	89	-56.91	0.78	1.81
Niagara Mohawk Power	90	-61.54	0.30	0.78
Delmarva Power & Light	91	-66.67	0.60	1.80
Philadelphia Electric	92	-75.42	0.58	2.36
Sierra Pacific Power	93	-82.93	0.35	2.05
Centel*	94	-85.32	0.75	5.11
Commonwealth Edison	95	-92.23	0.22	2.83
Public Service of New Mexico	96	-113.29	-0.23	1.73
FPL Group* (FP&L)	97	-191.67	-2.86	3.12
Florida Progress* (FPC)	98	-191.67	-2.86	3.12
CMS Energy*	99	-259.74	-6.07	3.80
Tucson Electric Power	100	-336.62	-15.50	-3.55

SALES DATA

		1990 Total Sales (KWH)		1990 Sales (KWH) By Type of Customer (% of Sales)				Average Annual Residential Use		Ratio of Long-Term Debt to Net Plant	
Company	**Rank**	**% Increase**	**Average Annual Growth 1985-1989**	**Resid.**	**Comm.**	**Indus.**	**Other**	**1990**	**1989**	**1990**	**1989**
Cincinnati Gas & Electric	1	15.21	4.20	28.43	22.47	24.44	24.66	10,421	11,058	46.13	42.07
Pinnacle West Capital*	2	13.08	5.03	29.22	33.21	14.45	23.12	11,033	11,077	48.32	45.13
LG&E Energy Corp.*	3	12.03	5.56	25.01	22.13	23.35	29.50	10,132	10,182	31.57	38.66
Portland General*	4	10.86	0.21	31.81	27.19	18.31	22.68	12,496	12,568	42.35	45.49
Centel*	5	10.69	-0.48	27.41	29.38	21.48	21.73	7,077	6,848	0.00	0.00
Nevada Power	6	9.91	6.23	42.70	19.52	31.78	6.00	13,331	13,624	58.12	60.30
Sierra Pacific Power	7	9.80	6.37	26.00	33.70	35.45	4.85	7,397	7,449	46.06	45.98
Iowa Southern*	8	9.49	4.86	32.05	16.42	42.23	9.30	8,837	8,539	35.91	36.65
Washington Water Power*	9	6.15	1.57	28.21	20.22	12.67	38.90	13,383	13,621	53.70	54.49
Pacific Gas & Electric	10	6.15	1.56	31.36	34.93	21.97	11.74	6,443	6,468	47.41	48.89
Gulf States Utilities	11	5.46	-1.06	23.59	18.60	46.08	11.72	13,795	13,228	41.04	46.21
Entergy*	12	5.44	0.92	29.28	20.91	36.73	13.09	12,177	11,639	52.76	54.47
Northern States Power	13	5.29	3.50	24.25	14.16	43.37	18.22	7,668	7,779	31.34	32.00
Philadelphia Electric	14	5.00	3.23	28.61	14.77	48.25	8.38	7,553	7,655	53.83	52.42
Oklahoma Gas & Electric	15	4.69	-0.04	31.11	21.86	27.62	19.40	11,501	10,916	38.53	38.74
San Diego Gas & Electric	16	4.50	4.77	35.94	37.53	21.06	5.16	5,580	5,447	39.06	37.72
Puget Sound Power & Light	17	4.22	3.51	42.74	28.44	18.19	10.63	12,848	13,430	56.14	55.50
TECO Energy*	18	4.18	1.82	40.28	31.49	20.97	7.26	13,489	13,258	32.00	32.30
Hawaiian Electric*	19	4.17	3.98	27.66	26.43	45.20	0.71	7,416	7,318	33.21	31.89
Boston Edison	20	4.08	2.18	23.97	50.18	12.23	13.62	6,150	6,160	46.65	42.71
Southern Company*	21	4.03	0.92	23.26	20.83	32.29	23.62	11,637	11,287	42.89	43.40
Southern Indiana Gas & Electric	22	3.99	5.83	20.11	17.93	32.70	29.26	11,203	11,199	43.80	42.92
Empire District Electric	23	3.97	0.52	32.59	23.88	20.61	22.91	10,744	10,399	41.11	40.50
Central Louisiana Electric	24	3.93	2.28	39.47	17.69	34.97	7.88	12,526	12,164	38.00	31.44
Utilicorp United	25	3.88	0.39	39.15	22.50	16.82	21.53	10,516	10,385	61.59	43.60
Kansas City Power & Light	26	3.77	2.98	31.44	45.93	20.87	1.75	9,267	8,877	33.79	39.54
Interstate Power	27	3.77	3.05	21.37	16.85	55.58	6.20	7,704	7,632	38.66	43.38
Central & South West*	28	3.77	0.23	29.71	24.64	31.95	13.71	11,238	10,908	33.28	35.30
Wisconsin Public Service	29	3.69	4.06	23.51	24.57	30.36	21.56	7,495	7,450	33.77	31.58
Midwest Resources Inc.*	30	3.68	7.81	27.67	22.77	26.88	22.67	8,600	8,637	42.78	43.53
Minnesota Power	31	3.61	4.95	8.54	8.53	72.87	10.06	8,303	8,297	53.24	51.75
Southern California Edison*	32	3.58	1.28	31.19	35.56	21.00	12.25	6,335	6,217	46.50	46.35
Eastern Utilities Associates*	33	3.57	2.74	28.83	30.47	15.80	24.90	6,221	6,226	57.98	52.31
Kentucky Utilities	34	3.44	4.06	29.53	21.84	20.54	28.08	11,546	11,923	46.66	44.77
TNP Enterprises* (Tex-NM Power)	35	3.37	-1.22	31.13	22.44	44.35	2.08	11,613	11,236	48.05	37.14
SCANA Corporation* (SCE&G)	36	3.36	2.83	33.04	28.50	29.45	9.02	13,330	12,891	36.82	41.07
Otter Tail Power	37	3.29	-0.82	28.08	15.29	37.77	18.86	10,098	10,239	32.69	29.42
Houston Industries*	38	3.04	0.65	28.04	20.47	49.67	1.82	13,849	13,271	40.89	42.05
Northern Indiana Public Service	39	3.03	1.62	17.30	18.82	60.77	3.11	6,841	6,854	35.56	38.10
Madison Gas & Electric	40	2.98	3.30	27.70	56.85	6.95	8.49	6,471	6,474	39.04	40.71
Green Mountain Power	41	2.83	4.95	32.06	62.21	5.71	0.00	8,658	9,049	46.80	46.80
Pacificorp	42	2.81	15.65	22.12	18.31	39.25	20.32	10,283	10,209	43.78	45.20
New York State Electric & Gas	43	2.46	1.33	29.64	18.03	17.69	34.65	7,796	7,786	48.91	50.92
Florida Progress* (FPC)	44	2.39	4.92	45.74	27.00	12.73	14.53	12,319	12,059	33.18	33.19
St Joseph Light & Power	45	2.37	3.36	38.81	28.90	31.33	0.96	9,897	9,615	29.64	33.37
Delmarva Power & Light	46	2.33	5.39	27.81	26.89	28.36	16.94	9,524	9,639	43.06	41.72
Public Service of Indiana	47	2.21	2.73	26.73	22.78	36.39	14.10	10,962	11,314	37.20	37.54
Public Service of Colorado	48	2.19	2.49	27.56	50.50	16.79	5.15	6,445	6,348	31.93	36.63
Texas Utilities*	49	2.18	2.34	33.51	29.62	27.04	9.83	14,046	13,747	42.71	40.13
Iowa-Illinois Gas & Electric	50	2.16	1.78	25.95	27.67	43.50	2.88	6,874	6,696	38.16	40.75
Rochester Gas & Electric	51	2.02	1.26	26.91	24.61	25.05	23.43	7,044	7,101	45.67	49.45
Potomac Electric Power	52	1.91	3.83	25.55	42.76	21.52	10.17	10,605	10,719	43.18	39.94
El Paso Electric	53	1.89	7.46	22.03	24.80	13.10	40.06	6,082	6,124	55.36	52.12
Atlantic Energy*	54	1.83	4.57	42.13	39.49	17.74	0.64	8,251	8,382	38.45	43.72
Commonwealth Edison	55	1.71	2.63	26.69	30.28	30.08	12.96	6,718	6,647	39.76	37.34
American Electric Power*	56	1.68	2.50	21.20	15.57	32.78	30.44	10,530	10,953	44.53	47.55
Orange & Rockland Utilities	57	1.65	4.78	36.91	25.60	35.07	2.41	6,893	6,922	48.56	40.20
FPL Group* (FP&L)	58	1.55	5.14	51.00	40.42	6.19	2.39	11,955	11,895	37.88	38.18
Consolidated Edison	59	1.54	3.63	27.80	67.03	3.63	1.54	3,840	3,884	39.39	38.12
IPALCO Enterprises*	60	1.27	2.90	31.47	20.38	47.40	0.75	10,514	10,668	36.66	37.45
Central Hudson Gas & Electric	61	1.05	2.50	26.60	25.39	33.69	14.32	6,940	7,011	4.97	54.51
Union Electric	62	0.99	2.09	32.22	33.75	28.60	5.43	10,283	10,289	38.18	41.31
Central Maine Power	63	0.83	3.39	33.51	25.14	39.71	1.64	7,115	7,382	48.73	45.28
Cilcorp*	64	0.78	3.22	30.35	24.21	44.50	0.94	9,171	9,206	34.10	34.50
IE Industries*	65	0.77	1.39	33.18	28.74	29.07	9.01	8,405	8,329	33.31	38.06
Illinois Power	66	0.63	1.96	26.49	18.70	48.62	6.19	8,585	8,755	52.09	52.98
General Public Utilities*	67	0.61	3.08	34.53	30.38	31.89	3.20	8,146	8,260	35.36	36.26
Southwestern Public Service	68	0.46	1.79	13.15	13.48	37.98	35.39	8,311	7,934	37.09	40.00
Niagara Mohawk Power	69	0.42	0.06	29.01	32.70	33.41	4.89	7,570	7,700	56.76	57.04
DPL*	70	0.35	4.04	32.67	21.68	31.34	14.31	10,148	10,705	47.73	51.53
CIPSCO Inc.*	71	0.25	0.14	32.11	12.59	49.18	6.12	9,164	9,196	38.60	38.91
Northeast Utilities*	72	0.22	7.33	32.06	30.33	18.40	19.19	8,304	8,460	49.24	50.12
KPL Gas Service	73	0.12	1.36	24.50	30.09	19.92	25.49	9,117	8,618	35.13	33.62
Detroit Edison	74	0.03	2.12	28.36	21.40	46.08	4.16	6,583	6,668	57.09	55.38
CMS Energy*	75	0.02	1.59	32.20	28.40	36.90	2.50	7,321	7,361	82.35	83.62
Duke Power	76	-0.02	3.90	25.71	22.44	38.66	13.19	12,444	12,459	36.72	35.65
New England Electric*	77	-0.06	3.33	35.84	36.52	23.73	3.91	6,824	7,089	41.24	42.94
Kansas Gas & Electric	78	-0.08	4.06	25.40	20.57	34.61	19.42	9,951	9,248	44.37	38.75
Pennsylvania Power & Light	79	-0.20	4.66	29.20	24.67	25.19	20.94	9,947	10,064	36.26	39.05
Baltimore Gas & Electric	80	-0.69	5.17	38.25	10.48	51.27	0.00	10,209	10,438	45.41	41.11
DQE*	81	-0.75	1.15	22.57	38.39	24.17	14.86	5,953	6,060	49.28	50.42
Bangor Hydro-Electric Company	82	-0.80	3.26	32.42	30.27	35.56	1.76	6,376	6,548	61.99	53.26
Wisconsin Power & Light	83	-0.99	1.84	27.00	15.49	33.39	24.12	8,471	8,655	33.80	30.32
Public Service Enterprise Group*	84	-1.47	3.06	26.89	46.44	25.38	1.29	6,128	6,221	37.81	37.75
Ohio Edison	85	-1.78	2.07	24.04	20.34	31.53	24.08	8,159	8,336	51.33	50.54
United Illuminating	86	-1.93	2.02	35.10	43.41	20.38	1.11	6,627	6,814	70.42	63.30
MDU Resources Group	87	-1.94	2.37	33.62	16.12	33.54	16.72	7,689	7,876	46.37	47.03
Dominion Resources*	88	-2.03	5.19	34.79	30.62	16.49	18.10	12,156	13,109	43.23	46.81
Carolina Power & Light	89	-2.13	4.59	24.80	18.99	30.55	25.67	12,279	12,419	43.26	40.16
Montana Power Co.	90	-2.34	3.72	20.46	21.92	32.92	24.70	8,812	9,094	50.46	48.29
Long Island Lighting	91	-2.48	3.98	42.86	NA	51.01	6.13	7,844	7,933	157.75	163.96
Wisconsin Energy*	92	-2.62	5.92	26.20	25.17	37.05	11.59	7,709	7,691	43.91	52.77
Centerior Energy*	93	-2.87	2.18	24.88	25.56	45.42	4.13	7,079	7,295	44.96	42.43
Allegheny Power System*	94	-3.31	4.95	19.70	11.67	28.88	39.75	10,011	9,950	40.65	40.32
Commonwealth Energy System*	95	-5.71	4.61	25.33	28.41	6.63	39.63	6,555	6,591	42.76	37.46
Idaho Power	96	-7.46	-1.22	26.35	16.15	29.53	27.98	14,281	14,923	38.69	38.03
Tucson Electric Power	97	-10.15	-0.90	30.69	17.71	39.29	12.31	8,621	8,879	31.31	72.87
Public Service of New Mexico	98	-10.47	1.53	21.98	31.67	13.95	32.40	6,129	6,066	44.45	44.38
Central Vermont Public Service	99	-10.47	4.92	32.51	28.27	13.39	25.83	7,697	8,066	42.38	42.83
Public Service of New Hampshire	100	NA	NA	NA	NA	NA	NA	NA	NA	67.58	66.85

TABLE I THE TOP 10 IN KWH SALES

RANK '90	RANK '89	COMPANY	KWH SALES (billions)	'90 % Change
1	1	Southern Company*	142.4	4.03
2	2	American Electric Power*	119.5	1.68
3	3	Texas Utilities*	83.7	2.18
4	4	Commonwealth Edison	74.1	1.71
5	8	Pacific Gas & Electric	73.4	6.15
6	5	Southern California Edison	71.6	3.58
7	6	Duke Power	67.0	-0.02
8	7	FPL Group (FP&L)*	65.7	1.55
9	10	Entergy*	62.1	5.44
10	11	Houston Industries*	59.6	3.04

Residential sales moved ahead 1.5 percent, just 0.1 percent better than a year earlier. Total residential sales were 661-billion kWh.

The greatest increase in sales occurred to commercial customers, which purchased 3.2 percent more kWh than in 1989. Commercial sales totaled 579-billion kWh. Although this was the largest gain, the rate remained 38 percent below the commercial kWh increase in 1989.

Sales to commercial customers rose 5.2 percent in 1989, to 579-billion kWh.

Industrial sales increased 1.1 percent in 1990, to 661-billion kWh. This was just a half-percent greater than a year earlier. For 1989, industrial sales eked out just a 0.6-percent gain, reflecting directly the lackadaisical progress of industrial output and productivity.

Sales to "Other" customers rose 2.7 percent in 1990. While this was one of the brighter areas of progress, the increase represented a slowing in the growth rate from last year. For 1989, sales to other customers—which includes other utilities, municipalities, co-ops, railroad and other special customers—increased 4.9 percent.

Overall, 76 utilities reported increases in kWh sales in 1990. This compares with 79 utilities that posted gains in 1989 and 99 utilities in 1988.

Largest gain, 15.2 percent, was posted by Cincinnati Gas & Electric Co, which recorded total sales of 13.6-billion kWh. Runnerup was Pinnacle West Capital, which recorded a gain of 13.08 percent to 19.8-billion kWh, largely on the strength of sales to other utilities. Third-best sales gain was recorded by Louisville Gas & Electric, whose 12.0-percent overall sales increase was fueled by a strong jump in sales to other customers and utilities.

Median sales growth, 2.14 percent, was slightly higher than 1989's 1.84 percent. While this is an improvement, the increase reflects only a return to pre-1989 levels. Last year's performance was well off the trend line of recent years. At best, median sales growth in 1990 can be said to be a return to normal.

The *largest* sellers of electricity were virtually the same as in 1989, although there were changes in relative position. As shown in Table I, the first four companies, perennial #1 Southern Company, followed by American Electric Power, Texas Utilities and Commonwealth Edison, remained the same as in 1989. Pacific Gas & Electric, which recorded the 10th best sales gain, 6.15 percent, moved from 8th in '89 to 5th in 1990, displacing Southern California Edison, which slipped to 6th in 1990. Duke and FPL Group slipped one place in 1990, to 7th and 8th, respectively.

TABLE 2: THE TOP 10 TOTAL REVENUES '90

Rank '90	Rank '89	COMPANY	$ REVENUES (millions)	'90 % Change
1	1	Pacific Gas & Electric	9,470	10.27
2	2	Southern Company*	7,975	6.45
3	3	Southern California Edison	7,199	4.26
4	4	FPL Group* (FP&L)	6,289	1.77
5	6	Consolidated Edison	5,739	3.39
6	5	Commonwealth Edison	5,282	-8.50
7	7	American Electric Power*	5,167	0.53
8	8	Public Service Enterprise Group*	4,800	-0.10
9	9	Texas Utilities*	4,543	5.14
10	11	Houston Industries*	4,179	10.26

Entergy moved from 10th in 1989 to 9th in 1990, and Houston Industries moved into the Top 10 from 11th in 1989.

Residential usage fell

Average residential usage declined in 1990 for the second straight year. Adjusted figures show that average residential use in 1989 was 9158 kWh, down from 9174 kWh in 1989 and well below the record 9358 kWh posted in 1988.

Highest average residential use occurred in areas of lowest cost, such as the Pacific Northwest, where many customers are all-electric, or in Southern states where July and August temperatures send meters spinning. Idaho Power, with average residential use of 14,281 kWh, ranked first again despite a decline of 4.3 percent from '89. Second was Texas Utilities, 14,046 kWh, up 2.2 percent. In third position was Houston Industries, up 4.4 percent to 13,849 kWh. Rounding out the Top 10 were: 4) Gulf States Utilities, 13,795 kWh; 5) TECo Energy, 13,489 kWh; 6) Washington Water Power, 13,383 kWh; 7) Nevada Power, 13,331 kWh; 8) SCANA Corp., 13,330; 9) Puget Sound Power & Light, 12,848 kWh; and 10) Central Louisiana Electric, 12,526 kWh. CLECO was new to the top ranking this year.

Revenues gained

Total corporate revenues by the Top 100 electric utilities rose 3.5 percent, to $171.7 billion, an off performance from 1989, when revenue growth was 4.8 percent. As previously mentioned, however, the total was a new record for the industry.

Total corporate revenues include all activities of the Top 100, including electric and gas utility operations and all other business operations by the companies and their subsidiaries, both regulated and unregulated.

Revenues from electric operations represented 97 percent of total revenues for the Top 100 in 1990 and grew 3.5 percent to $166.8 billion. Revenues from electric operations were 90 percent of total utility revenues and grew by 4.1 percent in 1990.

Revenues from gas operations declined 2.8 percent, compared with a 5.2-percent increase in '89 (helped out by December 1989's cold snap). Gas operations represented 9 percent of utility operating revenues in 1990.

Revenues from non-utility operations, which include unregulated subsidiary activities of holding companies, amounted to just $4.9 billion, an increase of 2.9 percent in 1990 over 1989.

Seventy-nine companies reported revenue gains, about the same as last year, which meant that 21 reported

FINANCIAL STATISTICS

Company	Net Income Rank	Net Income % Gain	Revenue Rank	Revenue % Gain	Sales (KWH) Rank	Sales (KWH) % Gain	Int. Cov. Ratio 1990	Int. Cov. Ratio 1989	Earnings Per Share $ 1990	Price/Share 1990 (Dollars) High	Price/Share 1990 (Dollars) Low	% Change Long-Term Debt '89-'90
Portland General*	1	471.11	20	6.96	4	10.68	1.39	-0.13	2.17	22.125	14.875	-6.85
Boston Edison	2	330.22	87	-0.85	20	4.06	0.73	-0.34	2.01	20.250	16.500	13.19
Long Island Lighting	3	250.34	43	4.23	91	-2.48	0.52	-0.36	2.36	21.750	12.625	-0.09
Entergy*	4	201.21	21	6.93	12	5.44	0.75	-0.72	2.44	23.625	18.000	-3.76
United Illuminating	5	160.43	33	5.19	86	-1.93	0.45	-0.72	3.55	34.125	26.875	6.10
Pinnacle West Capital*	6	117.65	27	5.88	2	13.08	0.73	0.92	1.12	18.625	9.375	6.21
New England Electric*	7	89.00	6	12.92	77	-0.06	2.72	1.52	4.11	28.625	22.500	3.18
IE Industries*	8	80.98	39	4.74	65	0.77	0.93	1.31	4.10	28.125	23.000	-6.99
Northern Indiana Public Service	9	73.46	91	-2.47	38	3.03	1.20	0.62	1.81	19.250	15.750	-7.15
El Paso Electric	10	71.32	65	1.47	53	1.89	-0.57	-1.73	-0.96	9.125	3.500	8.93
Illinois Power	11	64.60	23	6.33	66	0.63	-0.58	-1.59	-1.53	19.375	12.750	-6.27
SCANA Corporation* (SCE&G)	12	48.10	71	0.88	35	3.36	NA	NA	4.44	35.750	30.250	-6.46
LG&E Energy Corp.*	13	37.22	63	1.74	3	12.03	1.72	1.30	4.31	42.000	35.250	12.13
Kansas Gas & Electric	14	35.76	12	9.95	78	-0.08	0.84	0.56	2.00	27.750	19.625	13.47
Washington Water Power*	15	31.27	37	4.85	9	6.15	1.40	1.07	3.46	31.000	25.500	-0.07
Detroit Edison	16	23.23	49	3.24	74	0.03	0.99	0.83	3.26	30.250	23.500	7.96
Utilicorp United	17	21.94	4	15.80	25	3.88	1.04	1.01	2.13	22.375	17.375	52.58
Central & South West*	18	16.34	18	7.65	28	3.77	1.11	1.11	3.79	46.000	36.625	-0.95
Wisconsin Power & Light	19	15.65	58	2.26	83	-0.99	2.05	1.86	2.23	25.250	20.000	12.42
Puget Sound Power & Light	20	14.93	32	5.35	17	4.22	1.43	1.24	2.16	22.500	18.625	2.65
Orange & Rockland Utilities	21	12.90	41	4.30	57	1.65	1.49	1.41	3.54	32.375	26.125	28.06
DPL*	22	12.21	85	-0.62	70	0.35	NA	NA	2.23	20.375	17.125	-0.42
San Diego Gas & Electric	23	11.97	25	6.13	16	4.50	1.81	1.73	3.52	46.250	39.000	4.88
Southwestern Public Service	24	11.24	94	-3.64	68	0.46	2.23	1.95	2.73	31.380	25.130	-7.86
Pacific Gas & Electric	25	11.21	10	10.27	10	6.15	1.11	0.96	2.10	25.625	20.000	-0.30
KPL Gas Service	26	9.81	59	1.96	73	0.12	1.27	1.32	2.25	25.125	19.750	8.11
Texas Utilities*	27	9.21	35	5.14	48	2.18	NA	NA	4.40	39.000	32.000	15.02
Empire District Electric	28	9.09	24	6.19	23	3.97	1.61	1.67	3.12	31.500	27.250	11.76
Dominion Resources*	29	8.52	93	-3.53	88	-2.03	1.03	1.05	4.38	48.875	41.375	-4.03
Oklahoma Gas & Electric	30	7.73	16	7.84	15	4.69	1.90	1.72	3.38	39.750	32.875	-0.09
DQE*	31	7.67	68	1.21	81	-0.75	0.83	0.72	2.24	25.250	20.375	-2.53
Madison Gas & Electric	32	6.96	67	1.37	39	2.98	1.54	1.37	3.06	35.500	31.250	-3.57
Central Hudson Gas & Electric	33	5.79	19	7.15	61	1.05	0.86	0.79	2.38	24.875	20.000	-90.92
Carolina Power & Light	34	4.96	57	2.41	89	-2.13	1.13	1.40	4.36	47.625	38.000	3.59
Union Electric	35	4.90	74	0.63	62	0.99	1.49	1.51	2.74	30.000	24.625	-7.53
Central Louisiana Electric	36	4.46	31	5.53	24	3.93	1.32	1.22	3.70	36.500	31.500	23.03
Southern Indiana Gas & Electric	37	4.23	50	3.13	22	3.99	1.87	1.66	3.02	33.375	27.875	7.09
TECO Energy*	38	4.13	46	3.49	18	4.18	2.28	2.16	2.45	33.875	26.250	-0.11
Delmarva Power & Light	39	3.83	54	2.73	45	2.33	1.40	1.42	0.60	21.375	17.000	11.85
MDU Resources Group	40	2.88	97	-6.17	87	-1.94	1.20	1.08	1.43	22.875	18.125	-1.89
Pacificorp	41	1.68	77	0.40	41	2.81	1.93	1.89	1.85	23.875	17.500	0.44
IPALCO Enterprises*	42	1.49	55	2.71	60	1.27	1.83	1.70	2.58	27.500	23.125	-0.40
Gulf States Utilities	43	1.28	34	5.18	11	5.46	-0.39	-0.36	-0.99	12.625	8.625	-13.12
Southern California Edison*	44	1.04	42	4.26	31	3.58	1.25	1.22	3.60	40.250	33.500	-0.22
Northeast Utilities*	45	0.92	28	5.77	72	0.22	0.99	0.92	1.94	22.625	17.875	-1.24
CIPSCO Inc.*	46	0.60	86	-0.64	71	0.25	1.61	1.59	1.92	23.250	19.500	0.00
New York State Electric & Gas	47	0.38	38	4.84	42	2.46	0.86	0.83	2.48	29.250	21.375	-1.77
Wisconsin Public Service	48	0.08	100	-86.37	49	2.18	NA	NA	4.40	39.000	32.000	7.08
Public Service Enterprise Group*	49	0.03	81	-0.10	84	-1.47	1.45	1.53	2.56	29.750	22.500	5.94
Iowa Southern*	50	-0.18	78	0.40	8	9.49	2.43	2.37	3.54	34.250	29.500	-0.41
Central Maine Power	51	-0.57	14	8.75	63	0.83	0.86	0.90	1.68	20.625	16.125	15.14
Kentucky Utilities	52	-0.85	44	4.11	33	3.44	2.85	2.93	1.97	21.625	17.250	3.06
Centerior Energy*	53	-0.91	53	2.83	93	-2.87	0.69	0.72	1.90	21.125	16.125	5.53
Otter Tail Power	54	-1.38	82	-0.17	36	3.29	2.28	2.23	1.99	26.750	22.000	13.42
General Public Utilities*	55	-1.50	52	2.91	67	0.61	1.44	1.50	5.02	47.250	38.500	1.27
TNP Enterprises* (Tex-NM Power)	56	-1.76	36	5.02	34	3.37	0.68	1.06	1.84	22.500	14.500	159.69
Allegheny Power System*	57	-1.82	62	1.75	94	-3.31	1.34	1.42	3.61	42.125	34.000	4.05
Public Service of Colorado	58	-1.83	84	-0.39	47	2.19	1.37	1.36	2.49	26.500	20.000	-7.85
Green Mountain Power	59	-2.19	56	2.50	40	2.83	1.24	1.59	2.29	27.125	21.250	6.38
Pennsylvania Power & Light	60	-2.37	66	1.37	79	-0.20	1.09	1.04	3.95	44.375	39.000	-6.54
Cincinnati Gas & Electric	61	-3.13	80	0.07	1	15.21	2.00	2.19	4.12	31.750	26.000	22.49
Public Service of New Hampshire	62	-3.33	29	5.77	100	NA	-0.84	-3.61	-4.98	3.875	2.125	0.00
Wisconsin Energy*	63	-3.73	92	-3.41	92	-2.62	2.31	2.33	2.77	32.500	26.625	-3.58
Central Vermont Public Service	64	-4.14	60	1.84	99	-10.47	1.18	1.25	2.43	29.500	21.875	13.11
St Joseph Light & Power	65	-4.34	73	0.85	44	2.37	2.47	2.42	2.48	28.250	22.750	-8.91
Public Service of Indiana	66	-4.66	96	-5.79	46	2.21	2.01	1.65	2.20	18.250	14.500	3.73
Iowa-Illinois Gas & Electric	67	-5.33	90	-1.83	50	2.16	1.72	1.84	1.99	23.250	18.750	-6.18
Interstate Power	68	-5.59	79	0.35	27	3.77	1.81	1.66	2.56	26.750	22.875	-4.93
Kansas City Power & Light	69	-5.76	45	4.06	26	3.77	1.28	1.20	3.11	35.875	29.125	-14.58
Duke Power	70	-5.85	70	1.16	76	-0.02	2.14	2.43	2.40	32.375	25.500	9.93
Consolidated Edison	71	-6.04	47	3.39	59	1.54	2.07	2.38	2.34	29.250	19.750	7.83
Potomac Electric Power	72	-11.28	69	1.20	52	1.91	1.41	1.74	1.62	24.000	18.000	18.57
Florida Progress* (FPC)	73	-11.92	30	5.76	43	2.39	1.68	1.73	3.21	40.500	33.500	2.47
Northern States Power	74	-12.49	40	4.31	13	5.29	1.63	1.91	2.83	40.500	28.375	-1.83
Atlantic Energy*	75	-14.93	64	1.67	54	1.83	1.42	1.72	3.02	38.500	31.875	-3.43
Rochester Gas & Electric	76	-16.18	89	-1.75	51	2.02	0.90	1.02	1.72	21.750	16.875	-5.63
Minnesota Power	77	-16.78	51	2.93	30	3.61	1.50	1.87	2.37	27.375	22.125	0.62
Houston Industries*	78	-17.90	11	10.26	37	3.04	1.63	3.17	2.67	37.125	30.625	-3.53
Idaho Power	79	-19.25			96	-7.46	1.21	1.46	1.91	29.375	22.750	3.52
Montana Power Co.	80	-19.29	83	-0.34	90	-2.34	0.94	1.07	1.84	21.750	17.375	6.64
Bangor Hydro-Electric Company	81	-20.45	8	11.02	82	-0.80	0.56	0.88	1.52	16.750	13.875	34.45
American Electric Power*	82	-21.07	76	0.53	56	1.68	1.13	1.19	2.65	33.125	26.000	-4.45
Ohio Edison	83	-23.69	48	3.27	85	-1.76	0.80	0.98	1.67	23.875	15.875	1.02
Southern Company*	84	-28.61	22	6.45	21	4.03	0.74	1.09	1.91	29.375	23.000	-1.36
Cilcorp*	85	-28.71	2	17.19	64	0.78	1.55	1.67	2.69	38.625	29.750	-0.04
Baltimore Gas & Electric	86	-29.10	17	7.74	80	-0.69	1.06	1.80	2.10	34.625	24.375	20.31
Midwest Resources Inc.*	87	-31.45	95	-4.15	29	3.68	1.13	1.18	1.25	19.250	18.000	-1.50
Hawaiian Electric*	88	-31.95	5	14.33	19	4.17	1.49	1.61	2.02	40.000	27.250	12.29
Eastern Utilities Associates*	89	-40.29	9	10.60	32	3.57	0.53	1.84	1.53	41.500	20.750	22.79
Commonwealth Energy System*	90	-47.13	72	0.86	95	-5.71	0.45	0.95	2.16	38.875	29.375	20.49
Nevada Power	91	-51.44	3	16.01	6	9.91	0.60	1.46	0.78	25.750	20.000	13.24
Niagara Mohawk Power	92	-61.57	15	8.56	69	0.42	0.13	0.35	0.30	14.750	11.750	2.43
Philadelphia Electric	93	-74.92	13	8.80	14	5.00	0.21	0.97	0.58	23.500	14.500	1.18
Sierra Pacific Power	94	-82.60	26	6.11	7	9.80	1.05	1.18	0.35	25.500	18.375	5.59
Cental*	95	-85.81	7	12.06	5	10.69	NA	NA	0.75	0.000	0.000	NA
Commonwealth Edison	96	-92.35	99	-8.50	55	1.71	0.07	0.95	0.22	37.875	27.250	5.63
Public Service of New Mexico	97	-113.25	98	-6.57	98	-10.47	-0.14	0.95	-0.23	15.500	8.125	-1.44
FPL Group* (FP&L)	98	-195.27	61	1.77	58	1.55	1.32	1.42	-2.86	36.500	26.125	4.97
CMS Energy*	99	-258.33	75	0.54	75	0.02	-1.65	1.66	0.00	38.500	24.875	3.46
Tucson Electric Power	100	-342.09	88	-1.69	97	-10.15	-4.17	-1.40	-15.50	19.000	5.500	-57.26

ALPHABETIC LISTING OF COMPANY PERFORMANCE

Company	Electric Sales (KWH) (millions)	Rank	Customers Served Electric Total	Electric % Gain	Gas Total	Gas % Gain	REVENUES Total $ (1000's)	REVENUES % Electric	REVENUES % Gas	Net Income After Tax $ (Thousands)
Allegheny Power System*	57,174	11	1,289,684	1.50	0	0.00	2,297,826	100.00	0.00	191,355
American Electric Power*	119,482	2	2,747,013	1.15	0	0.00	5,167,406	100.00	0.00	496,414
Atlantic Energy*	7,757	70	449,717	1.28	0	0.00	716,779	100.00	0.00	88,879
Baltimore Gas & Electric	24,620	31	1,030,973	1.86	520,034	0.08	2,159,263	78.00	17.29	172,939
Bangor Hydro-Electric Company	1,596	98	96,975	4.68	0	0.00	133,927	99.12	0.00	6,756
Boston Edison	14,314	48	677,667	0.69	0	0.00	1,258,546	100.00	0.00	77,788
Carolina Power & Light	40,385	16	966,776	1.71	0	0.00	2,617,107	100.00	0.00	361,687
Centel*	2,939	92	136,169	0.06	0	0.00	1,149,323	15.11	0.00	63,014
Centerior Energy*	26,789	30	1,026,393	0.57	0	0.00	2,367,675	100.00	0.00	264,459
Central Hudson Gas & Electric	5,684	80	252,314	1.13	55,399	3.07	503,608	86.15	13.85	35,354
Central Louisiana Electric	5,637	81	201,763	1.15	0	0.00	333,978	100.00	0.00	41,683
Central Maine Power	9,213	86	482,796	1.38	0	0.00	772,601	99.09	0.00	45,142
Central Vermont Public Service	2,861	93	137,940	0.93	0	0.00	231,565	98.69	0.00	16,533
Central & South West*	50,013	13	1,560,000	0.91	0	0.00	2,744,000	95.12	4.77	356,000
Cilcorp*	5,026	85	186,558	0.64	190,306	0.57	537,461	53.81	25.74	34,504
Cincinnati Gas & Electric	22,006	34	679,761	1.63	399,980	1.85	1,438,468	77.92	22.08	212,571
CIPSCO Inc.*	7,515	72	307,848	0.32	158,936	0.56	600,772	82.76	17.24	65,756
CMS Energy*	29,673	26	1,475,000	1.51	1,362,000	1.79	2,977,000	62.28	35.74	(494,000)
Commonwealth Edison	73,448	5	3,218,426	1.22	0	0.00	5,261,986	100.00	0.00	45,796
Commonwealth Energy System*	6,874	74	346,679	1.44	224,116	0.20	812,805	68.09	30.03	21,224
Consolidated Edison	35,474	21	2,936,743	0.55	1,029,761	0.12	5,738,888	82.68	12.16	534,415
Delmarva Power & Light	11,081	57	368,277	1.97	85,044	2.61	811,238	87.33	9.84	89,597
Detroit Edison	40,596	15	1,927,466	1.16	0	0.00	3,306,739	99.17	0.00	479,280
Dominion Resources*	54,774	12	1,778,693	1.80	0	0.00	3,532,500	97.99	0.00	445,700
DPL*	12,628	54	452,494	0.76	278,490	0.75	954,512	76.88	21.47	153,003
DQE*	13,637	49	574,525	0.34	0	0.00	1,134,283	100.00	0.00	121,672
Duke Power	66,982	7	1,632,100	2.32	0	0.00	3,681,467	100.00	0.00	538,188
Eastern Utilities Associates*	5,310	83	289,003	12.63	0	0.00	451,867	95.87	0.00	24,407
El Paso Electric	5,984	78	243,736	1.92	0	0.00	432,501	99.34	0.00	(33,745)
Empire District Electric	3,245	91	118,059	1.74	0	0.00	141,612	99.46	0.00	18,296
Entergy*	62,069	9	1,722,038	0.90	156,499	0.17	3,982,062	97.79	2.21	478,318
Florida Progress* (FPC)	27,144	29	1,157,966	2.56	0	0.00	2,010,800	83.07	0.00	164,80
FPL Group* (FP&L)	65,662	8	3,208,196	2.73	0	0.00	6,289,038	77.90	0.00	(391,005)
General Public Utilities*	38,712	17	1,862,721	1.15	0	0.00	2,996,011	100.00	0.00	278,234
Green Mountain Power	1,769	97	76,947	2.08	0	0.00	147,633	100.00	0.00	8,545
Gulf States Utilities	28,964	28	570,738	1.32	83,164	0.58	1,690,685	94.44	1.95	(107,024)
Hawaiian Electric*	7,968	69	346,417	1.94	0	0.00	1,010,765	69.73	0.00	43,602
Houston Industries*	59,557	10	1,380,597	2.00	0	0.00	4,178,576	83.01	0.00	339,454
Idaho Power	12,960	53	291,810	2.61	0	0.00	464,935	100.00	0.00	64,962
IE Industries*	4,521	88	209,689	0.60	123,345	0.66	453,919	71.58	21.37	59,898
Illinois Power	15,941	45	560,033	2.06	396,891	3.08	1,395,690	77.71	22.29	(115,323)
Interstate Power	4,523	87	158,289	0.51	46,511	1.00	271,653	81.19	18.81	27,026
Iowa Southern*	2,363	94	94,576	0.42	38,449	0.52	138,241	77.55	20.44	20,432
Iowa-Illinois Gas & Electric	4,541	86	193,961	0.75	231,912	0.96	485,062	59.94	40.06	53,490
IPALCO Enterprises*	11,391	56	384,884	1.48	0	0.00	611,160	95.28	0.00	96,939
Kansas City Power & Light	10,605	59	412,585	0.76	0	0.00	761,157	99.65	0.00	96,372
Kansas Gas & Electric	8,937	67	256,216	0.55	0	0.00	586,641	98.20	0.00	63,363
Kentucky Utilities	13,587	50	417,300	1.21	0	0.00	553,781	100.00	0.00	106,216
KPL Gas Service	9,810	62	304,804	0.89	1,068,198	0.18	1,149,755	40.33	59.67	77,875
LG&E Energy Corp.*	11,579	55	324,538	1.24	246,556	1.20	698,959	74.47	24.23	91,422
Long Island Lighting	16,386	44	1,001,440	0.50	430,571	1.06	2,446,847	85.24	14.76	263,156
Madison Gas & Electric	2,267	95	112,374	1.19	67,331	3.28	220,568	63.41	36.28	22,029
MDU Resources Group	2,108	96	109,489	-0.18	177,500	0.95	247,086	48.26	51.74	16,984
Midwest Resources Inc.*	10,932	58	409,105	0.97	356,061	2.73	894,357	64.77	29.19	62,299
Minnesota Power	10,270	61	120,994	1.23	17,771	-1.22	477,477	84.24	2.41	70,020
Montana Power Co.	8,864	68	250,083	0.93	113,647	2.34	450,338	75.72	24.28	44,331
Nevada Power	9,222	65	347,969	9.41	0	0.00	481,045	100.00	0.00	24,992
New England Electric*	21,381	35	1,256,656	0.26	0	0.00	1,855,427	9.35	0.00	262,050
New York State Electric & Gas	17,947	43	769,023	1.46	146,037	2.55	1,496,780	8.16	10.84	145,351
Niagara Mohawk Power	35,544	20	1,520,000	1.06	475,000	1.93	3,154,719	8.61	15.39	40,578
Northeast Utilities*	29,611	27	1,260,181	0.68	0	0.00	2,616,319	9.95	0.00	211,007
Northern Indiana Public Service	13,328	52	381,909	1.18	594,927	1.56	1,520,995	5.90	41.10	125,088
Northern States Power	36,586	19	1,318,935	1.45	358,155	3.74	2,064,548	8.72	15.28	177,303
Ohio Edison	31,310	24	1,035,416	0.95	0	0.00	2,225,524	9.86	0.00	254,048
Oklahoma Gas & Electric	20,424	37	641,994	0.54	0	0.00	1,230,770	100.00	0.00	136,731
Orange & Rockland Utilities	4,054	89	248,758	1.25	105,528	1.29	559,248	78.95	21.05	49,839
Otter Tail Power	3,364	90	121,287	-0.01	0	0.00	172,541	100.00	0.00	22,749
Pacific Gas & Electric	74,057	4	4,197,000	2.12	3,450,000	2.31	9,470,092	7.30	25.70	889,169
Pacificorp	49,697	14	1,236,221	1.53	0	0.00	2,182,385	9.96	0.00	451,799
Pennsylvania Power & Light	34,603	22	1,161,228	1.54	0	0.00	2,388,720	9.93	0.00	297,781
Philadelphia Electric	34,310	23	1,465,592	0.85	47,287	2.09	3,705,161	8.61	10.39	123,871
Pinnacle West Capital*	19,776	40	606,605	1.98	0	0.00	1,596,639	9.47	0.00	97,333
Portland General*	19,837	39	584,025	3.22	0	0.00	852,406	9.39	0.00	99,952
Potomac Electric Power	23,932	32	648,140	1.57	0	0.00	1,411,713	9.72	0.00	154,601
Public Service Enterprise Group*	36,723	18	1,862,947	0.77	1,464,803	1.11	4,800,135	6.42	25.76	542,278
Public Service of Colorado	20,148	38	990,633	0.71	865,399	1.45	1,733,939	6.09	32.40	133,705
Public Service of Indiana	21,147	36	594,068	1.33	0	0.00	997,817	9.75	0.00	119,393
Public Service of New Hampshire	0	100	0	NA	0	0.00	660,122	100.00	0.00	(210,012)
Public Service of New Mexico	7,168	73	291,695	1.61	345,719	1.91	855,134	63.30	35.33	(9,560)
Puget Sound Power & Light	19,572	41	745,524	3.90	0	0.00	935,273	100.00	0.00	119,948
Rochester Gas & Electric	7,711	71	328,895	0.97	261,516	1.25	830,891	71.54	28.46	59,881
San Diego Gas & Electric	15,089	47	1,095,168	2.39	673,481	1.81	1,771,868	7.55	2.04	196,978
SCANA Corporation* (SCE&G)	15,385	46	446,514	2.65	220,817	7.37	1,133,222	7.84	2.80	181,603
Sierra Pacific Power	5,793	79	239,449	3.12	77,339	4.88	470,705	8.95	1.03	7,828
Southern California Edison*	71,614	6	4,031,678	2.30	0	0.00	7,198,531	9.06	0.00	786,360
Southern Company*	142,388	1	3,283,000	1.39	0	NA	7,975,000	9.61	0.00	604,000
Southern Indiana Gas & Electric	5,557	82	114,655	0.71	95,488	1.31	326,415	7.59	19.21	36,409
Southwestern Public Service	18,178	42	349,893	0.62	0	0.00	769,944	9.45	0.00	111,563
St Joseph Light & Power	1,336	99	59,284	0.65	6,145	1.10	79,752	8.24	4.38	10,215
TECO Energy*	13,436	51	461,497	1.77	0	0.00	1,097,063	8.72	0.00	139,358
Texas Utilities*	83,728	3	2,152,179	.95	0	0.00	4,542,623	100.00	0.00	850,802
TNP Enterprises* (Tex-NM Power)	6,422	76	203,121	1.00	0	0.00	397,289	100.00	0.00	15,137
Tucson Electric Power	6,744	75	269,055	1.60	0	0.00	499,037	100.00	0.00	(397,226)
Union Electric	30,445	25	1,086,609	0.73	112,170	0.81	2,023,017	9.86	3.97	279,526
United Illuminating	5,205	84	307,116	-0.15	0	0.00	593,663	9.44	0.00	49,297
Utilicorp United	6,076	77	257,300	2.02	570,700	6.69	894,370	3.96	56.34	58,912
Washington Water Power*	10,597	60	250,347	1.63	94,274	4.86	554,441	7.91	10.96	79,185
Wisconsin Energy*	23,657	33	896,393	1.53	0	0.00	1,442,502	8.75	0.00	186,722
Wisconsin Power & Light	9,505	63	345,123	2.64	124,698	2.96	618,491	7.12	17.85	59,538
Wisconsin Public Service	9,288	64	328,159	1.73	176,429	2.27	588,973	7.22	23.78	45,730

TABLE I THE TOP 10 IN KWH SALES

RANK '90	RANK '89	COMPANY	KWH SALES (millions)	'90 % Change
1	1	Southern Company*	142.4	4.03
2	2	American Electric Power*	119.5	1.88
3	3	Texas Utilities*	83.7	2.18
4	4	Commonwealth Edison	74.1	1.71
5	8	Pacific Gas & Electric	73.4	6.15
6	5	Southern California Edison	71.6	3.58
7	6	Duke Power	67.0	-0.02
8	7	FPL Group (FP&L)*	65.7	1.55
9	10	Entergy*	62.1	5.44
10	11	Houston Industries*	59.6	3.04

negative revenue changes.

Median revenue change was 2.9 percent. It was 3.3 percent in 1989.

The largest revenue producers are ranked in Table II.

Net income fell

Net incomes of the Top 100 electric utilities dropped 5.7 percent in 1990, to $14.0 billion. It was the third straight year of declining net income for the Top 100. The 1990 total was 16.8 percent below the record net income figure of $16.7 billion posted in 1984.

The fall-off in net incomes is the result of slow kWh growth and unfavorable commission rate decisions, coupled with steadily increasing operating costs.

Utility managements reported exerting continued strong pressures to reduce operating costs, but were unsuccessful in stemming the tide of adverse figures.

Utility operations were responsible for producing $13.5 billion of total corporate income of $14 billion. This means that utility operation incomes produced 96.4 percent of utilities' profits. Non-regulated activities provided just $500 million of net income.

Considering that more than 38 holding companies reported to *EL&P* for 1990, the average of $13 million per company is disappointing, to say the least.

Fifty companies reported negative income growth, compared with 38 a year ago.

Median income growth was -0.18 percent in 1990. A year earlier, the median growth was +0.26 percent.

Among the biggest income producers, shown in Table III, eight of the ten biggest are repeaters from last year. The two newcomers were Detroit Edison and Entergy (formerly Middle South Utilities).

Notable by its absence among the 10 biggest income producers was Commonwealth Edison, which posted net income of just $45.8 million, down 92.4 percent from $599 million in 1989. CECo has been plagued by three nuclear plants that had been operating without rate-base relief because of extended challenges. CECo had a rate plan rejected and refund mandated by the Illinois Supreme Court last summer.

Sagging per-share performance

Earnings per common share declined 4.0 percent in 1990, to an average of $1.98 per share. A year ago, EPS was $2.06 per average share (restated). The drop reflects both the generally lower income production and additional shares outstanding.

A total of 65 companies reported earnings higher than the average, compared with 64 a year ago.

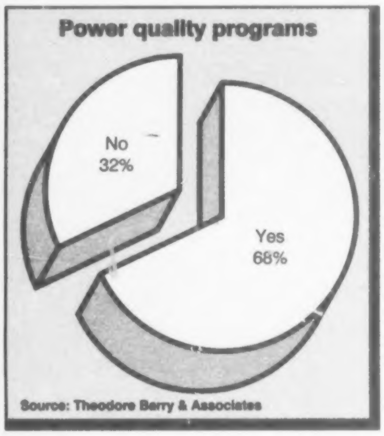
Median EPS rate of change was just 0.2 percent, down from 0.31 percent in 1989.

Shares of the Top 100 electric utilities hit an average high of $28.87 in 1990, a dip of 5.6 percent from 1989's average per-share high price. The low average per-share price in 1990 was $22.41, 4.1 percent below the average per-share low price of $23.38.

New reliability indices are needed, according to survey

Derek HasBrouck
Theodore Barry & Associates

LOS ANGELES—Do electric utility customers receive reliable electric service? Most utility engineers, regulators, and independent analysts would answer with an emphatic yes! They might even go so far as to question if the level of reliability currently provided is too high.



Source: Theodore Barry & Associates

Figure 1. Some 68 percent of utilities surveyed have power-quality improvement programs despite an overall industry conception of more than adequate reliability.

Yet, in a recent survey of electric utility executives in the transmission/distribution area, customer service improvements were the top priority of 7 of 10, and 68 percent of these utilities have formal initiatives underway to improve the quality of service they deliver (Fig. 1).

Are these two concepts really contradictory? The industry has relied on standard reliability measures that can be characterized as introverted engineering measures. The most common of these, the Average Service Availability Index (ASAI), is a broad index that measures the percentage of the hours per year that electric service is available. Based on a survey of 100 investor-owned utilities, the average ASAI value is 99.985, with 99.995 and 99.800 as the high and low values, respectively (Fig. 2).

This outstanding average performance and these seemingly small deviations support the traditional viewpoint that the industry provides outstanding service reliability.

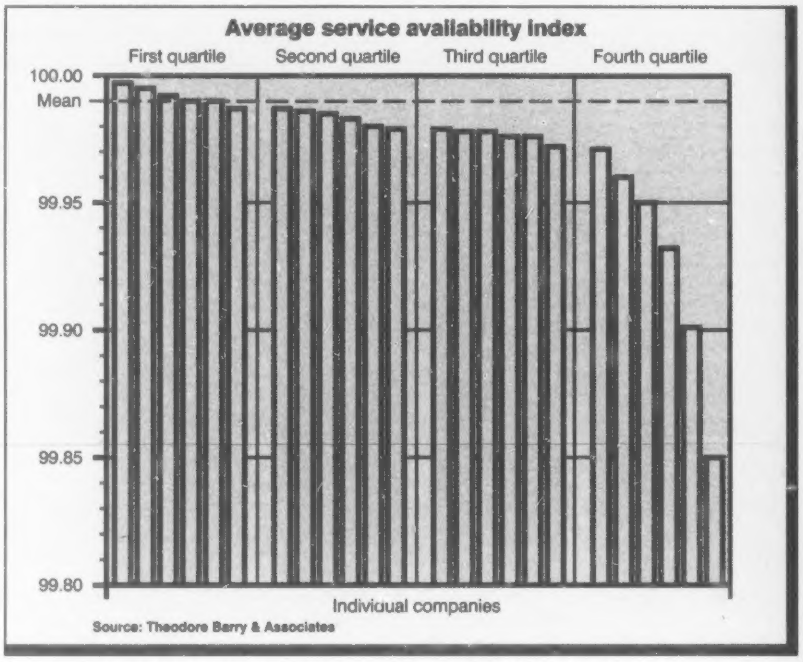
Traditional index questioned

This traditional viewpoint can be seriously questioned on two fronts. First, do these indices accurately reflect service reliability from the *customer's* perspective? Second, do utilities collect, report, and use these indices to manage the business effectively?

The engineering indices strive to measure the percentage of the year that service is available. On the surface, this is congruent with the customer's desires. However, the indices include only sustained outages longer than a specified minimum duration (Figs. 3, 4). This duration, which varies by company, is typically between one minute and five minutes, although some companies exclude outages up to an hour in duration.

Thus, all momentary outages and many short duration outages are ig-

Continued on page 35



Source: Theodore Barry & Associates

Figure 2. The average service availability index (ASAI) is a high 99.985, but this index may not adequately measure reliability from the customer's viewpoint.

Accurate, timely weather data is a must

STATE COLLEGE, PA—Commercial weather services have supplied forecasts to utilities since the 1950s, but the number of utilities using these services has grown tremendously over the past decade. The growth is due in part to the increased ability of commercial weather services to give utilities accurate, timely and customized forecasts.

Accu-Weather Inc., State College, PA, is one of the weather services companies that can take a standard National Weather Service forecast that might call for "a 50 percent chance of rain tonight," and time customize it to "rain this evening only," or "rain after midnight," as well as predicting the intensity: "heavy, strong thunderstorms this evening, light showers after midnight."

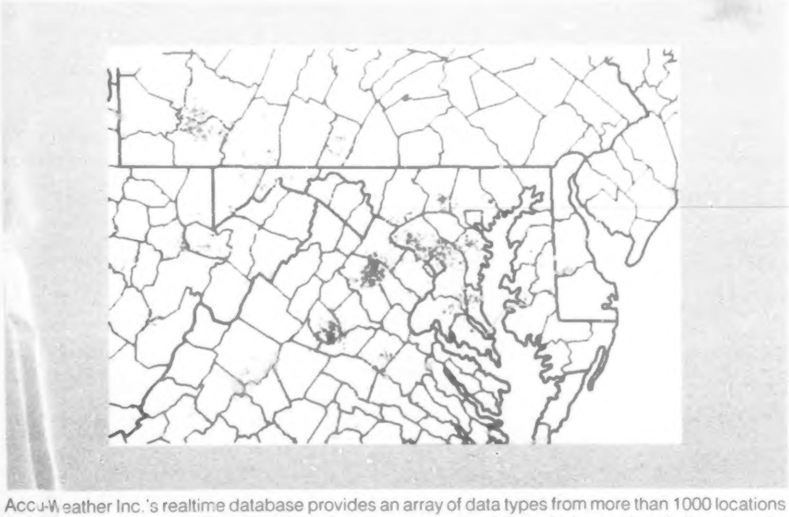
Pinpointing the daily high and low temperatures help system dispatchers determine the times of peak load and prepare accordingly. Commercial weather services predict temperatures to the nearest degree and often into three-hour or even hourly intervals.

Customized reports

A utility that serves a large area will most likely have several different weather patterns at the same time. National Weather Service forecasts do not typically include such details, but a breakdown is available commercially.

Accu-Weather's real-time database provides an array of data types from more than 1000 locations throughout the U.S. and Canada such as: temperature, humidity, wind speed and direcgion, sky cover, precipitation, atmospheric stability, and barometric pressure. Data are analyzed by the 72 professional meteorologists and monitored hourly, 365 days per year. Updates are sent to utilities based on anticipated variations, such as temperature changes or the development of poten-

Continued on page 34



Accu-Weather Inc.'s realtime database provides an array of data types from more than 1000 locations throughout the U.S. and Canada such as: temperature, humidity, wind speed and direction, sky cover, precipitation, atmospheric stability, and barometric pressure for use by utilities in planning for normal and emergency-related weather problems.

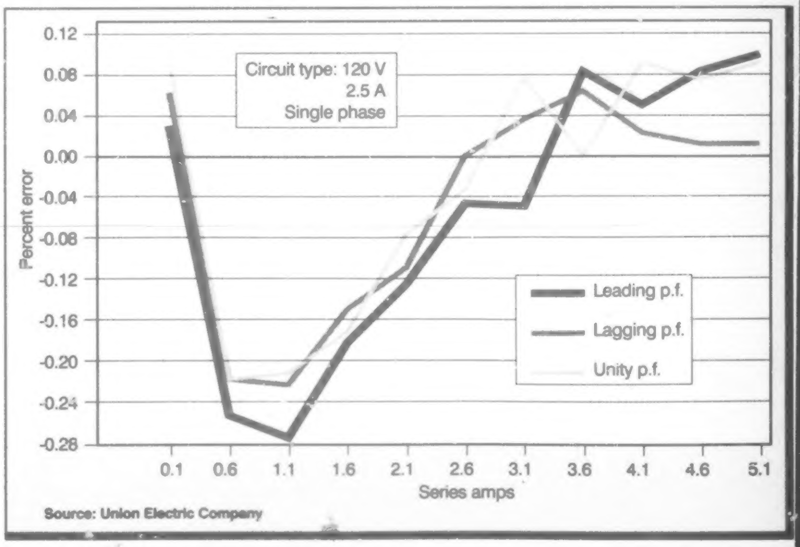
Is single-phase testing for all meters adequate?

ST. LOUIS—Single-phase testing of both 1-phase and 3-phase meters has become the preferred method in recent years. Utilities have drifted away from 3-phase testing primarily because of the cost of test boards, but also because 3-phase test boards are cumbersome to use. With today's technology, however, utilities now can purchase test boards that offer both single- and three-phase testing.

In order to accurately determine the available options and desirability of continuing with only single-phase testing or to invest in some of the latest technology in three-phase test boards, a thorough investigation of the accuracy of meter testing was needed.

Several types of meters would have to be tested that would realistically portray actual operating experience.

Continued on page 36



Source: Union Electric Company

Figure 1. Single-phase testing at 120 V and 2.5 A yields a relatively flat percent-error curve for meter type DW, Form 5A, meter code D4-A, except for light loads between 0.2 and 2.2 A.

from page 32

New reliability indices needed...

nored by these indices. These approaches presume the customer's preference (assuming costs are held constant), is to tolerate short interruptions in order to have more total hours of service available.

Some utilities disagree. They have instituted programs to minimize momentary outages at the expense of incurring additional sustained outages. Since instituting these programs, customer complaints have gone down, and qualitative customer service analyses suggest they are happier with this new level of service. Unfortunately, the reliability indices have, of course, declined as a result. Is this better service or not?

Customers determine quality

Because the customer ultimately determines value, more satisfied customers are a clear indication that this type of program improves value to the customer. The challenge is to devise indicators and barometers to help management define, measure, monitor, evaluate, and improve the customer's *perceived value.*

The first requirement for successful management of an issue or an organization is to have the right information. Useful customer-oriented reliability and customer-service measures or indicators are not now widely available to managers.

Today, introverted engineering measures are not adequate. About 25 percent of investor-owned utilities do not even track the existing ASAI indices. Of the 75 percent that do, many do not collect and report the indices in a rigorous fashion.

Thus, reliability information available to the average T&D executive to support operating decisions is very limited and of low quality.

Some better indices

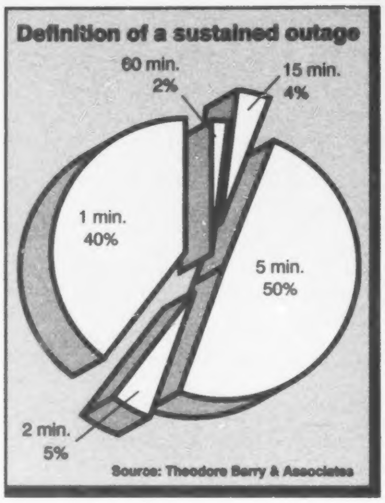
Several utilities use reliability indicators that come closer to the customer's perspective. Tracking momentary interruptions per customer, customer outage minutes, and monitoring waveform deviations at the meter are all examples of technical monitoring that come closer to the customer's perspective today.

Surveys targeted at customers who have recently suffered interruptions are used to understand the customer perceptions of reliability and service. Each of these measurement techniques allows management to understand past performance and set goals.

To deliver the *desired customer value level,* the manager can use these measures to quantify the expected impact of particular intitiatives and to evaluate each initiative relative to the required resource investment. The quantified expected-impact of each approved intitiative allows management to monitor implementation, make effective midcourse management intervention, and evaluate the ultimate success of each initiative. However, management's ability to actively manage service reliability and perceived customer value depends heavily on the availability of appropriate customer focused information.

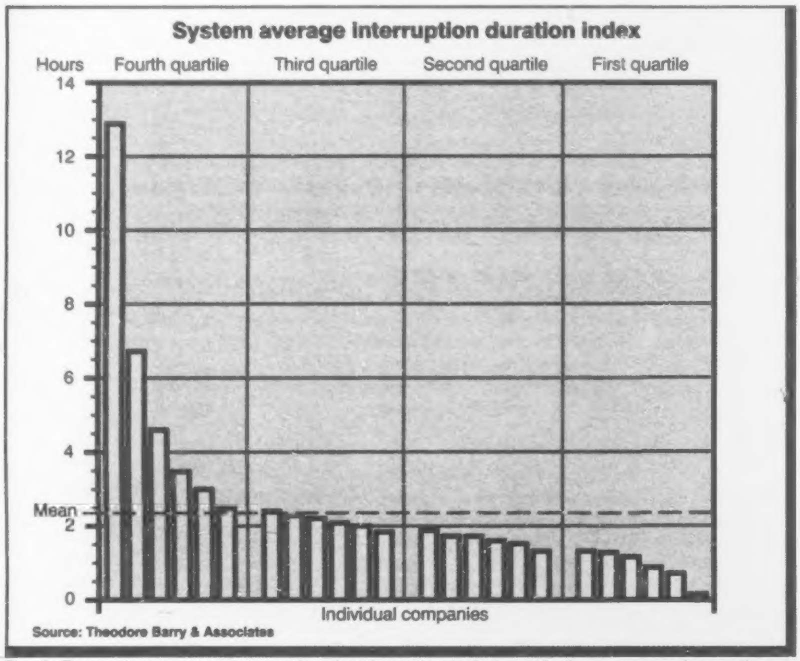
Service-reliability management offers a golden opportunity to create customer value and, indirectly, shareholder value. The opportunity exists to differentiate your services from the competition in the *eyes of the consumer* and to strategically position the utility for a more competitive marketplace.

To capitalize on these opportunities, management must revisit its traditional, introspective view of service reliability and, instead, focus on the customer's perspective. Today's service reliability management challenge is to define, collect, and put to use the required types of customer-focused service reliability and service quality information.



Source: Theodore Barry & Associates

Fig. 4. The definition of a sustained outage ranges from one minute to over an hour. Most fall between one and five minutes.



Source: Theodore Barry & Associates

Fig. 3. The system average interruption duration index includes only those outages longer than a specified duration—typically between one and five minutes, although some companies exclude outages up to an hour in duration.

BPA stops public use of ROW

PORTLAND, OR—Bonneville Power Administration is discouraging new uses of its power line rights-of-way that might expose the public to electric and magnetic fields (EMF).

In the past, BPA has encouraged multiple use of rights-of-way for parks, soccer fields, playgrounds, hiking trails, etc. Renee Ferrera, chief of BPA's land management section, says, "BPA has set a two-year moratorium on people-intensive uses of our rights-of-way."

Where BPA owns the right-of-way, it will refuse to issue a permit for public use and where only an easement is owned, it will attempt to prohibit projects that would increase public exposure. Where legal prohibition fails, BPA will discourage developers by providing information about the possible health effects of exposure to EMF.

Fred Johnson, director of BPA's division of system maintenance, points out, "We do not see, at this point, any demonstrated relationship between EMF and health effects. We want to allow some time to let the research catch up." BPA will not enforce the new policy retroactively but will apply only to new uses of power line corridors.

The moratorium will also help BPA with a problem unrelated to EMF. Encroachments that interfere with operations and maintenance is a growing problem. BPA says that people are building onto or using its rights-of-way in ways that conflict with its property rights.

Bulletin predicts sunspot activity

BOULDER, CO—Induced ground currents produced by solar disturbances in the earth's magnetic field can and have caused severe power disturbances. They can affect both transmission and distribution systems through low-frequency (almost dc) fluctuations that can saturate transformer cores, trip capacitor banks and depress voltage.

In an effort to help protect vital system components, the National Geophysical Data Center (NGDC) publishes a monthly Solar Indices Bulletin that details the level of solar activity for the past 30 days and predicts sunspot counts for the coming 12 months.

The bulletin includes explanatory text and a summary of the current solar cycle. The information is helpful in determining which phase of the current cycle we are in and can be used to mitigate the effects of solar activity.

Subscription

A 1-year subscription to the monthly bulletin is $20 and can be ordered from:

National Geophysical Data Center,
NOAA/NESDIS E/GC4, 325 Broadway,
Department 861, Boulder, CO 80303;
Phone: 303/497-6958.

LOOK TO
INIVEN™
TONES AND TELEMETRY

FOR UPGRADING AND MAINTAINING EXISTING SYSTEMS

- QUINDAR, DAQ, QEI, RFL, DOWTY
MECHANICAL/ELECTRICAL
COMPATIBLE REPLACEMENTS
FIXED FREQUENCY OR
PROGRAMMABLE UNITS
- STOCK DELIVERY
- EXTENDED WARRANTY
- LOWEST COST

INIVEN™
5 COLUMBIA ROAD
SOMERVILLE, NJ. 08876

TEL. 1-800-526-3984
FAX (908) 722-5461

Inquire R.S. 21

C6985-6A

ELECTRIC LIGHT & POWER

EL&P

JULY 1991
Volume 69, Number 7
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

EPA proposes rules to exclude most pollution-control changes from new-source review—the long-awaited "WEPCo fix."

Long Island Lighting's 345-kV, 26-mi submarine cable crossing operated commercially on 6/10.

Two transmission ties and joint U.S.-Mexican power plants were suggested in a joint DOE study.

Lightning caused a transformer fire and shutdown of the 186-MW Yankee Rowe nuclear unit.

Senate confirmation of Ivan Selin to replace NRC Chairman Kenneth Carr was expected by July 1.

PSNH emerges from Chapter 11

Public Service Co. of New Hampshire emerged from bankruptcy protection in late May, ending one of the more bizarre developments in recent electric utility history.

If regulatory approval is received, next step in the recovery of PSNH will be its acquisition by Northeast Utilities.

PSNH made headlines the world over with a Jan. 28, 1988, voluntary filing for bankruptcy protection from debt related to the long-delayed Seabrook nuclear plant.

PSNH emerged from bankruptcy on May 16, 1991, with $2.3 billion of new financing and seven years of 5.5-percent of rate increases. The company plans to be acquired by Northeast Utilities by fall. New Hampshire state regulators estimated a minimum of $300 million of synergies possible in the combination. Federal and state approvals are still needed

During 1988 and 1989 the bankruptcy was costing $1 million a month in legal and consulting fees, said Frank R. Locke, Northeast Utilities senior vice president and chief administrative officer-New Hampshire. The bankruptcy started with a $500 filing fee and finished with a bank transfer of $1.5 billion for distribution of money to holders of PSNH secured and unsecured debt.

"Fortunately," Locke said, "all parties recognized that the way to end a bankruptcy that was stifling the state's economy was through compromise and not through a decade of litigation."

Other financial transitions

Mergers and severe financial developments involve utilities in other regions. Companies in Iowa, Colorado, Arizona and Massachusetts are affected.

- The Securities and Exchange Commission cleared the way for July 1 merger of Iowa Southern Utilities and IE Industries by continuing exemption under the Public Utilities Holding Company Act. Formation of IES Industries, was OKd by shareholders in May.
- In Colorado, Colorado-Ute Electric Association, under Chapter 11 since March 1990, is reviewing two reorganization plans. Public Service Co. of Colorado and PacifiCorp submitted one plan, and Tri-State Generation and Transmission Association another.

Continued on page 13

WEPCo takes Edison Medal

SAN DIEGO—Wisconsin Electric Power Co. has won the 1990 Edison Medal, the investor-owned electric utility industry's highest honor. The award was made at the Edison Electric Institute's 5th Annual Convention here on June 5.

The company was recognized for its success in combining environmental stewardship with a high level of service to its customers.

EEI Chairman Jim Harlow, chairman and CEO of Oklahoma Gas & Electric Co., called the effort "more than just a statement of responsibility to preserve the nation's resources." He lauded WEPCo's follow-through that "demonstrated that earnest commitment to the environment and good business can be compatible goals."

The company earned the award for its community programs that promoted cooperation among the company, industry, the public and environmental groups. It sponsored Vision 2000, a community forum that pulled together more than 200 business, environmental, regulatory and educational leaders to discuss ways to reach consensus on environmental issues.

WEPCo also created an appliance rebate program that encouraged customers to turn in old, inefficient refrigerators and air conditioners and receive, in return, U.S. Savings Bonds. This enables the company to reduce demand. WEPCo also recycled the chlorofluorocarbons (CFCs) and metals from the turned-in units, rather than merely landfilling them. Almost 200,000 appliances were turned in, reducing landfill space by nearly 4-million ft^3 and recapturing about 18,000 lbs of refrigerants.

RESERVED FOR MAILING LABEL

Photo by U.S. Army Corps of Engineers

Corps, contractors repair Kuwait lines

KUWAIT CITY—Kuwait Emergency Recovery Office (KERO) advance team installs a spacer on the 40-km transmission line under repair from Al-Zoir power station to the Shuaiba substation. Oil well fires set by retreating Iraqis darken the sky. U.S. Army Corps of Engineers, Kuwaiti counterparts and contractors also completed emergency repairs to a major substation on 6th Ring Road, restored airport power and surveyed 64 damage sites as of late May. Corps contractors started work on four more transmission lines and the Fintas "W" substation. Three lines running 23 km from the Doha power station to Omeriya were repaired first (*EL&P*, p. 6, 6/91).

BPA and BG&E win 2nd annual *EL&P* substation design contest

BARRINGTON, IL—Bonneville Power Administration and Baltimore Gas & Electric Co. won *EL&P's* Second Annual Substation Design competition.

BPA's Pacific Northwest-Southwest HVDC Intertie Expansion captured top honors in the engineering/operations design competition. BG&E won the aesthetic design competition.

BPA modernized the Celilo Converter Station and was the first to use parallel converters in daily operation.

The substation, dedicated as the Eugene Starr Complex, raised the Intertie's capacity by 1100 MW (55 percent) to meet the demand for more effective service between Oregon and California.

It was completed in four years at a cost of $94.6 million and is expected to increase power revenues by $10-$35 million per year.

BG&E's Concord Street Substation, located on a two-thirds-acre site at the east end of Baltimore's Inner Harbor Development, took top honors in the aesthetic design competition.

BG&E engineers worked with city planners and a BG&E real estate development subsidiary to develop plans for the substation on the bottom floors of a 350,000 ft^2 office tower.

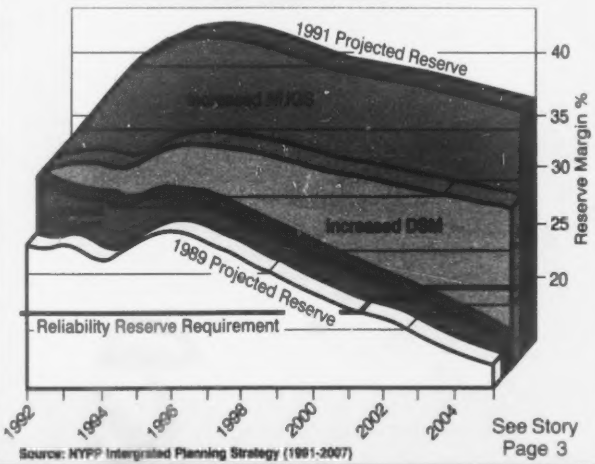
Other facilities reviewed include:

- New York Power Authority's North Transition Station (NYTS).
- Lansing (MI) Board of Water and Light's 138-kV Northeast Substation.
- Florida Power & Light Co.'s (FPL) Miami Substation.
- SRP's Noack Substation.

An independent panel of six judges named the winners.

The full report on award-winning substation design innovations starts on p.16.

NEW YORK POWER POOL PROJECTED RESERVE MARGINS
1989 vs 1991 Strategies



Source: NYPP Intergrated Planning Strategy (1991-2007)

See Story Page 3

NEWS BRIEFS

JILL MINNER, Special Projects Editor

Settlement reached in Grand Gulf case

Entergy Corp. announced that it has reached an agreement with utility regulators involving its investment in the Grand Gulf 1 nuclear unit. The settlement lowers Entergy's Grand Gulf return on equity from 14 percent to 13 percent and is retroactive to April 1990. Regulators had been seeking a reduction to 12 percent, according to Entergy.

The company said a refund will be divided between Entergy ratepayers in Arkansas, Louisiana, Mississippi and New Orleans based on percentage of entitlement to power from Grand Gulf. The refund will reduce 1991 rates by approximately $61 million, and 1992 revenues will be lowered by about $27 million, with declining amounts thereafter.

Also included in the settlement was a revision of the decommissioning fund allowed on Grand Gulf. The fund, which will cover the dismantling of Grand Gulf when its license expires in 2022, was increased to $220 million of principal. In 1985 the principal was set at $93 million, according to the company.

Entergy said it expects the settlement to be approved by th[illegible]deral Energy Regulatory Commission sometime this summer.

Tighter restrictions placed on unescorted access to nuclear plants

The Nuclear Regulatory Commission is placing tighter restrictions on individuals with unescorted access to protected and vital areas of nuclear power plants. In order to protect against the threat of radiological sabotage, the commission said it is amending its regulations to require plant licensees to establish an access authorization program.

The program must include three elements: background investigation, psychological assessment and behavioral observation. According to the NRC, the program will help insure that plant personnel with unescorted access are trustworthy and reliable.

The commission said nuclear power plant licensees have until April 25, 1992, to incorporate and implement the required authorization program into their site physical security plan.

Puget Power task force studies reliability

A reliability review team made up of representatives from a variety of departments at Puget Sound Power & Light Co. is investigating ways to improve the utility's current level of service. "This task force wasn't a knee-jerk reaction to the Arctic Express in December," stated Ron Bailey, Puget Power vice president-power systems. "We wanted the whole issue of reliability studied."

According to Puget Power, the team presented a proposal to senior management on June 1. In addition to service reliability, the team studied a number of areas including: outage statistics, T&D System Planning Guidelines, work practices, computer systems, equipment maintenance practices, customer perceptions, and current outage reporting procedures.

Calvert Cliffs improves

Baltimore Gas & Electric Co.'s Calvert Cliffs nuclear power plant is showing continued improvement, according to the Nuclear Regulatory Commission's Initial Systematic Assessment of Licensee Performance Report.

In its report, which covered the period from Jan. 1, 1990, to March 31, 1991, the NRC stated that Calvert Cliffs' "performance improvement program continues to make progress toward improving overall operations and interdepartmental communications. The organizational changes have also been effective in assuring good communications and in emphasizing a good safety perspective for all site activities."

The plant was rated in seven categories and received one superior rating and six good ratings. "Our long-term goal is to establish Calvert Cliffs as one of the superior nuclear power plants in the country," stated George C. Creel, BG&E vice president of nuclear energy. "This SALP report is a confirmation that we are moving forward and our workers should be commended, but there is always room for performance improvement," Creel added.

Coal conversion saves NEP customers $340M

New England Power, a subsidiary of New England Electric System, said it has saved customers $340 million from 1981 to 1990, by converting two of its major power plants from oil to coal. "The benefits derived from burning coal at our Salem Harbor and Brayton Point plants are numerous," explained NEP President George Sasdi. In addition to the savings customers realized, "we've reduced our use of foreign oil by approximately 50 percent, and coal burning has had important environmental benefits," Sasdi continued. "Converting our plants to burn coal has resulted in reducing particulate emissions by about three-quarters and sulfur dioxide emissions by about 20 percent, keeping our power plants' emissions well within regulatory limits."

Three generating units at NEP's Brayton Point Station were converted to coal in 1982, and three units at the utility's Salem Harbor Station were converted in 1984.

Personnel briefs

Richard A. Abdoo was appointed chairman, president and chief executive officer of **Wisconsin Energy Corp.** He succeeds Charles S. McNeer who retired May 1.

Iowa-Illinois Gas & Electric Co. President and Chief Operating Officer Stanley Bright was named to the additional post of chairman and chief executive officer. Bright replaces Barry O'Brien.

Timothy L. Guzzle, president and chief executive officer of **TECO Energy Inc.**, was elected chairman of the company. He succeeds H.L. Culbreath who has retired.

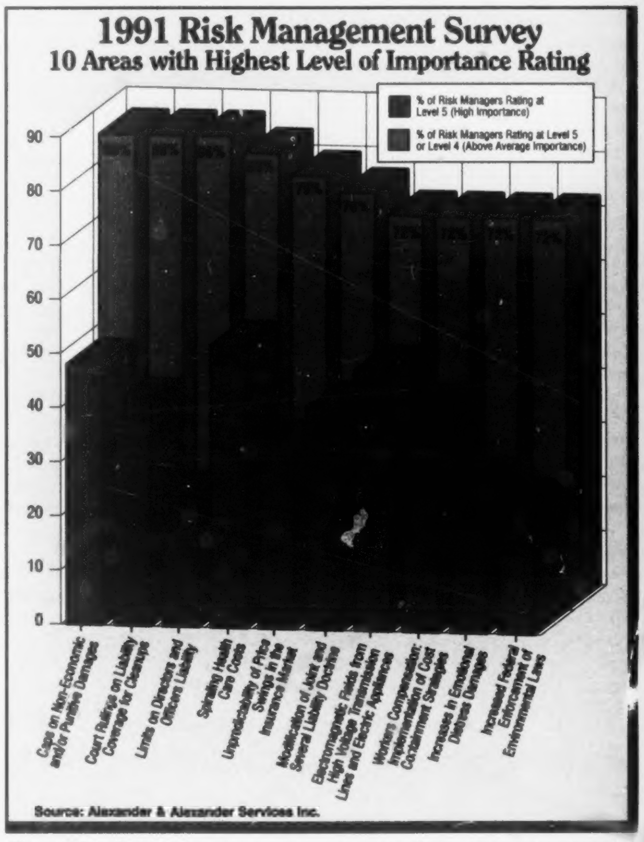
Commonwealth Edison Co. Chairman and Chief Executive Officer James J. O'Connor was appointed chairman of the **U.S. Council for Energy Awareness**.

Jack E. Thomas, executive vice president and chief operating officer of **San Diego Gas & Electric Co.**, was named president of the Pacific Coast Electrical Association.

General Public Utilities Corp. Chairman, President and CEO Standley H. Hoch has resigned for "personal reasons" because of "actions which he concluded diminished his effectiveness."

Kenneth A. Roe, chairman of **Burns & Roe Enterprises,** died of heart failure on June 4, in Ft. Lauderdale, FL.

Environmental cleanup liability, jury awards top list of utility concerns



1991 Risk Management Survey
10 Areas with Highest Level of Importance Rating

Source: Alexander & Alexander Services Inc.

Top utility business concerns are court rulings on environmental cleanup liability, caps on non-economic and/or punitive damages, and limits on directors and officers liability, said 86 percent of respondents to a recent national survey (see table).

The risk management survey, conducted by Alexander & Alexander Services Inc. (A&A), revealed other issues considered critical, such as modification of the joint and several liability doctrine and increases in emotional distress damages.

"Enormous costs of litigation and unpredictable liabilities arising from environmental hazards threaten the financial stability of American utility companies," explained A&A Senior Vice President Robert H. Moore.

In the area of health care costs, 83 percent of utility executives reported apprehension about corporate medical expenditures.

Additional areas of concern include broadened federal enforcement of environmental laws and employee safety from electromagnetic fields of high-voltage transmission lines and electric appliances (*EL&P*, pp. 1, 8, 3/91).

A&A said typical survey respondents included executives in companies with sales of at least $250 million, with almost half generating sales of at least $1 billion. While the survey focused on 90 legislative and regulatory issues, a breakdown of the types of utilities surveyed is not available, according to Barbara Rosenbaum, a spokesperson for A&A.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

WEPCo wins the Edison medal for serving customers and environment. 1
Power delivery and supply: Wrench in the works; Navajo line proposal. 3
What's the biggest obstacle to a new nuclear plant order? 3
BG&E and BPA take honors in *EL&P's* annual substation design contest. 16

GENERATION TECHNOLOGY

Utilities that cycle generating plants can gain from flexible automation systems. 20
Growth in waste-burning plants' number and total capacity is slowing. 20
Advanced nuclear reactors being tested, getting preliminary NRC approval. 22

T&D TECHNOLOGY

EPRI, BPA host transmission design meeting with Soviets. 32
Fleet standardization is economical but not popular. 32

REGULAR FEATURES

Commentary 4
Labor/Management Concerns 36
Rate Activity 37
Financial Performance 40
Information/Control Systems 41
Calendar 42
New Products 43
New Literature 46
Readers' Service 47
Regulatory Review 51
Management Methods 52

COMMENTARY

Franchise negotiations: Loud and showy in Chicago

When is a reliable system unreliable? The answer? When it's politically expedient to declare it so. Ask Commonwealth Edison, a favorite electric utility just down the road a piece from our offices.

CECo has been negotiating a new franchise agreement with the City of Chicago for nearly a year-and-a-half. The current agreement ends Dec. 31. True to its reputation, the city government has launched a full campaign of verbal pyrotechnics and accusations to build its case for a better deal. As previously reported, it has threatened to take over and operate the utility system in the city. The most recent charges are that CECo's Chicago system is archaic, maintenance lags the rest of its system and service is unreliable.

Negotiations moved along smoothly last year until the city was hit with a severe summer heat storm, meters whirled, equipment and people became superheated. Two substation fires blacked out between 60,000 and 65,000 residents...some for up to three days. Then in March, CECo received a $572-million rate increase. The double whammy changed the playing field.

Chicago officials screamed. In Chicago politics, "facts" are what the politicians in power say they are. The only thing that counts is making your point (just like in craps) while you're still in control. City Hall pols charged the "facts" showed CECo wash operating an antiquated system, failing to maintain its equipment, threatening the lives of residents with toxic chemicals (PCBs in transformers), overcharging customers...and generally running an unreliable electric system.

The Illinois Commerce Commission, which regulates electric utilities in the state, will complete its invesigation of the substation fires and CECo's reliability next spring...too late for consideration by the city before the franchise runs out. So the city launched its own investigation to show how bad CECO's service reliability really is.

But sometimes nothing you plan goes right. After conducting his study, the city's consulting engineer reported that CECo's operations were (gasp) reliable.

But wait, city officials demanded...whose data did was used in the consultant's study? Why, CECo's, of course, the consultant replied. "Aha," shouted Councilmen, "just as we thought...you've been brainwashed," or words to that effect. This prompted the head of the mayor's utility task force committee to ask, "So where should he have gotten data? Disney?"

The fireworks appear likely to continue for a while, but eventually calmer minds will prevail. What the City Council really wants is lower bills for residents, especially low-income residents, which would build voter support. It also wants stronger conservation efforts from the utility; a shorter term than the 40-year franchise that's running out; monthly, instead of annual payment of the franchise tax (which politicians and the media call a "fee") and hopefully, an increase from the current 4-percent of revenues rate.

CECo counters by seeking reduction or elimination of the franchise tax rate and insists on a 40-year agreement.

Despite all the shouting and verbal sabre rattling, the city *won't* make a real effort to buy out CECo's Chicago system. First, it has its hands full running even a garbage-disposal system, much less a complex, carefully balanced electrical network Second, the city would be hard pressed to raise the money necessary to buy out Edison's properties. And third, takeover of the CECo system would mean that the city stands to lose the present 17 cents of tax revenue it collects from every dollar of revenue CECo receives from Chicago customers-...not an insignificant factor to the economically stressed city.

No, Chicago officials—both elected and appointed—may be loud, crude and singularly politically motivated. But they aren't stupid. They'll charge inappropriate management, faulty procedures, underhanded and even illicit personal transactions, loudly and consistently in the local media. But in the end, there *will be* a new franchise agreement. The city will get some of its wish list 'demands'. CECo will receive the official blessings of the mayor and city council; CECo electricity will continue to run over CECo lines to its Chicago customers

It's a fact of life. Politicians must do something to stay in the public eye.

But like I said, they aren't stupid!

Robert A. Lincicome, Editor-in-Chief

EL&P
ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher

Robert A. Lincicome
Editor-in-Chief

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
Dianne Wilson, Editorial Assistant-Products/Literature
B. J. Davidson, Bulletin Board Coordinator
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402, (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101

BPA ABP Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

New video explores power quality needs in layman's terms

ST. PETERSBURG, FL—Solutions to residential customers' power quality problems are addressed in a 20-min. video now being made available to U.S. electric utilities. Produced in the style of the popular "This Old House" television program on public television, the video explains in down-to-earth, easy-to-understand terms why power quality should be a concern to customers, and what those customers can do to protect sensitive electronic devices.

A printed viewer guide accompanies the video.

The information presented is designed to help utility customer contact personnel respond in a positive manner when confronted by customers with residential power-quality problems.

Aimed at consumer

Robert S. Mason Jr., president of Bayboro Consulting Group Inc., serves as the moderator of the video and takes viewers on an electrical tour of a typical home—from the meter through the wiring to sensitive electronic equipment inside the house.

Bayboro produced the material in cooperation with the National Rural Electric Cooperative Association (NRECA), the electric cooperatives' trade organization.

Mason notes that the average American home is loaded with sensitive electronic equipment, such as big-screen TVs, home entertainment centers, personal computers and the like. Most consumers don't know they should protect these valuable assets...and if they do know, have a hard time finding out just how to do it.

"Did you ever try to buy a surge suppressor from a retail clerk?" Mason asks. "Take my word for it, folks. That can be a very frustrating experience."

Protection all around

Mason suggests building an electronic fence around a home to ensure that expensive electronic equipment is protected from normal electrical transients and voltage surges caused by lightning.

He points out that protecting a power line alone is insufficient to prevent damage to TVs and VCRs served by TV cable. Similarly, he says, phone lines also must be protected. "These lines—power, cable and phone—are three electrical gates into the house. These three gates must be kept closed at all times," he explained.

Mason describes an electronic fence as a lightning arrester installed at the meter and surge suppressors plugged into all wall outlets serving electronic equipment. He points out that dual protection—power-and-phone and power-and-cable—are available and should be used wherever appropriate.

The arrester handles the voltage surge from a nearby lightning strike and the suppressors handle the rest of the problems. He adds that no combination can protect against a direct strike.

Joint effort

Bayboro, part of Florida Power Corp., produced the tape and viewer guide to demonstrate how people have a source for answers to their power quality problems—their local electric utility. NRECA has the right to market the materials to co-ops, and Bayboro has the right to distribute them to all other electric utilities.

Utilities may buy a three-quarter-in. VHS master and duplicative masters for the viewer guides for $3,500, which includes full rights to reproduce the materials. A second option is to buy a half-in. VHS video and 25 viewer guides for $525.

In addition, Bayboro has produced a booklet that provides essentially the same information as the video. It also includes a walk-through equipment checklist that a homeowner can use to determine the protection needed.

For additional information, investor-owned utilities may contact Bayboro Consulting Group, 2951 34th Street South, St. Petersburg, FL 33707, (813) 866-9494. Electric cooperatives should contact NRECA at 18100 Massachusetts Ave., NW, Washington, DC 20036, (292) 857-9500.

Utilities may benefit from telco partnering

WASHINGTON—Competition and cooperation will be two of the questions examined in an upcoming seminar, "Telcos, Powercos and Cablecos—Rivals or Partners in the Local Loop?"

Issues to be addressed

The PennWell Conference, to be held Sept. 12-13 at the Hyatt Regency in Bethesda, MD (a Washington, D.C. suburb), will address issues including:

- Cost-effectiveness of utility cooperation among electric, gas and water utilities.
- Partnering with electric utilities on telemetry systems.
- Telephone utilities providing customized or enhanced local communications for electric utilities, including fiber optics.
- Power challenges for fiberoptic networks.
- Partnering opportunities for utilities and providers of local-loop communications.

Speakers and instructors include legal and technical experts from various utility and telecommunication companies and from industry suppliers.

More information

For more information contact Laura Ariane, PennWell Conferences, 713/621-9720.

Public Service of CO orders new SCADA/EMS

DENVER—Public Service of Colorado (PSCo) has announced that it will replace its supervisory control and data acquisition and automatic generation control with a new energy management system (EMS) supplied by ESCA Corp., Bellevue, WA.

Contract value

The contract is valued at $3-5 million. PSCo expects to complete the replacement relatively soon since it is derived from ESCA's energy management platform, a fully integrated and tested system.

The new system will also support distribution automation applications. ESCA will develop a new product that provides two-way transfer of information between relational databases and the real-time databases used by HABITAT, ESCA's operating environment.

Generating capacity

PSCo and its subsidiaries supply electricity and natural gas to 70 percent of Colorado, as well as to Cheyenne, WY. It has a generating capacity of 3265 MW and serves approximately 999,000 electric customers.

Cyclic operation needs flexible plant automation to succeed

CHICAGO—Flexible automation is the key to cyclic operation of power plants. But flexible automation strategies must be easily configurable by the user or the vendor.

As the power industry assumes a larger share of system load regulation requirements, more power plants are undergoing cyclic operation. Plant controls and monitoring need improvements to handle this cycling, said Robert N. Hubby of Leeds & Northrup Co. at the American Power Conference in Chicago in late May.

Requirements

He described some of the industry cycling requirements as:

- After an 8-hr shutdown, take a subcritical unit from first fire to full load in 90 min, and in 120 min for a supercritical unit.
- Turndown to 25 percent of full load, or less, without using supplementary fuel.
- Hold steam temperature deviation from setpoint during normal load changes to ± 10°F.
- Limit NOx and other environmental emissions to meet or exceed regulatory requirements. Automatically control maximum load change rates based on evaluation of the unit's ability to support sustained load ramp.
- Include the entire plant, especially auxiliary equipment and systems, in the coordinated control system.
- Utilize knowledge-based expert systems.

Hubby maintained that the key element that had to precede any application of advanced automation for cycling operation was sound boiler turbine control strategy that would allow the unit to respond to changing loads.

A well-designed, well-tuned boiler control system operating at fixed pressure—unlimited by controlled auxiliaries—typically can handle sustained load ramps of 5 percent per min over the full regulating range of the unit. Shorter load spans of approximately 10 percent can support rates of 10-20 percent per min.

For variable-pressure operation, the maximum sustained load ramp typically is 1-2 percent per min. It is limited primarily by the allowable stresses on the major boiler pressure components, such as drum metal temperature.

Four areas of equipment and strategies must be improved to safely and economically attain these cycles:

- Supervisory controls for advanced control and management of major auxiliaries.
- Extension of online performance calculations to support management of controllable losses and online calculation of unit heat rate.
- Coordination with energy management system to provide pertinent unit performance and capability data to improve response to area generation control and economic dispatch operations.
- Automated system tuning.

Supervisory controls

The four areas where supervisory control improvements would help in plant cycling are: automatic turbine startup and shutdown; burner management and furnace safety; automatic startup and shutdown of unit auxiliaries; and variable-pressure programming, noted Hubby.

These areas need two modes of control—a supervisory mode where the operator follows a sequential checklist to guide necessary plant actions and an automatic mode where the control system initiates necessary plant actions, except where operator decisions are necessary.

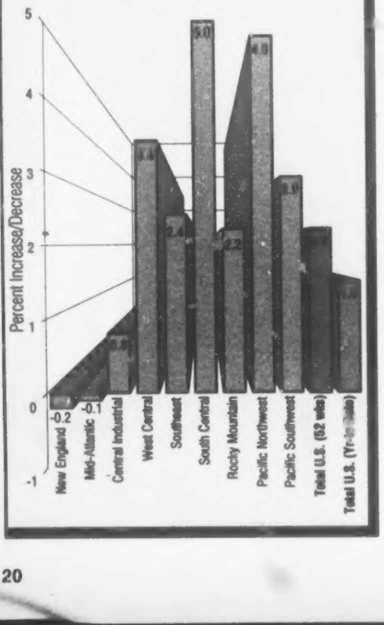
Online performance assessment

Because controllable losses must be

Continued on page 22

ELECTRIC OUTPUT
Still Growing

Net electric output from the Mainland U.S. electric utility industry increased for the 52 weeks ending May 11, as reported by Edison Electric Institute. Two geographical EEI regions, however, showed a decrease.



Fight zebra mussels with ship materials?

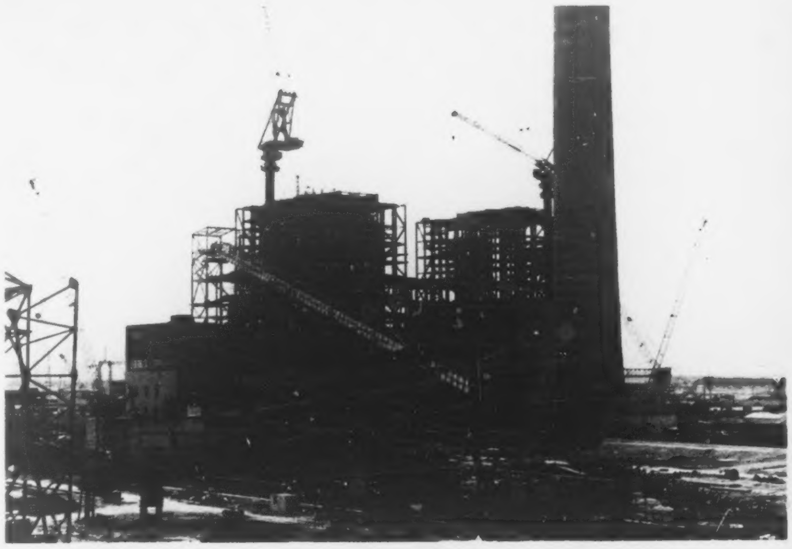
TORONTO—The Japanese have developed a cupronickel cladding for ships that may be applicable to the zebra mussel problem some utilities are beginning to experience at their power plants in the U.S.

The anti-fouling cupronickel-clad steel plates reject marine flora and fauna, and currently are being applied as ships' bottom shells and marine piping. The 0.5-mm-thick cladding material is available in Cu90/Ni10 and Cu70/Ni30.

Proof tests

A series of year-long field tests were performed on both types by NKK Corp., the Tokyo marketer, and Sakai Iron Works Co. Ltd. at Japanese coastal locations, according to the Nickel Development Institute. The tests showed that the cupronickel-clad plates resisted fouling much better than UNS S 31603 stainless steel, aluminum-bronze and a tar-epoxy coating.

Now a 90/10-clad sample is being comparison tested at sea attached to a ship of the Institute for Technical Research of Ships, Japan Ministry of Transportation.



Contractors see August '92 finish for new Shanghai generating plant

The Shanghai, China, area expects to have two new 600-MW units with supercritical, once-through boilers and single-reheat, condensing turbine-generators in August 1992. The facility is located in the town of Shengciao, which is 27 km (about 17 miles) northwest of Shanghai on the Yangtze River. In the foreground of the picture is one of two bucketwheel stacker/reclaimers that can stack coal at 3000 tons/hr and reclaim it at 300-1800 tons/hr. Sargent & Lundy is doing the plant design work and also leading a consortium that is overseeing the design and supplying all equipment. Coal-handling system subcontractor, McNally-Wellman Co., supplied the photo

Waste-burning capacity growth slows

NEW YORK—Developing and building waste-to-energy projects is not the growth business it was several years ago. Using the most recent figures available, Kidder, Peabody & Co. found that only 6000 tons per day of project capacities were awarded through the first 10 months of 1990.

Industry trends

In addition, Kidder revealed that although awards rose 24 percent in 1989 over 1988's, almost one-third of the new ones were dropped by July of '89. The number of new contracts remained essentially flat, about 13,000-14,000 tons per day capacity, from 1986 to '89.

Another industry trend has been to larger facilities—capacities of 400 tons per day and more. Prior to 1984, more smaller plants than larger ones were contracted for and built. Since 1988, only one or two small plants per year have been awarded.

Driving forces behind this trend include higher profitability in building larger facilities and better long-term environmental and operating histories of larger, state-of-the-art burn plants. The larger units also have economies-of-scale in garbage processing, site choice and project funding.

According to the Environmental Protection Agency, people and industry in the U.S. generate about 493,000 tons per day of municipal solid waste (MSW). Approximately 14.2 percent of this MSW (70,000 tons per day) goes to waste-to-energy plants. As recently as 1970, less than 1 percent of all MSW was incinerated in such plants. Most of the growth in this sector of the solid waste disposal market took place in the mid-'80s.

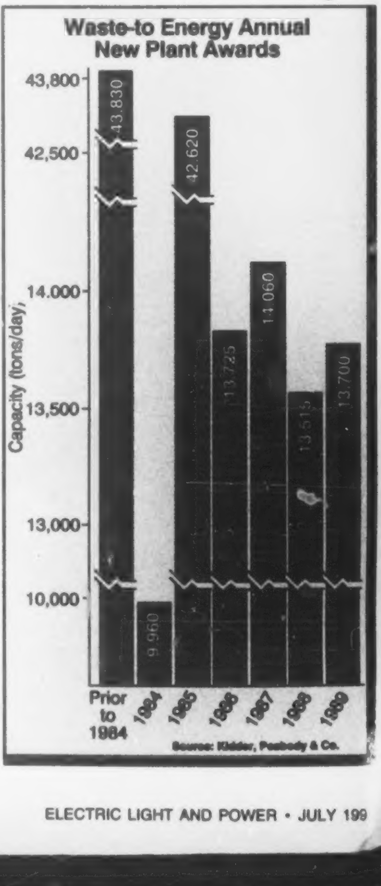
The good, the bad

Advantages of burning MSW in waste-to-energy plants include:

- Producing electricity and/or steam from waste.
- Reducing decomposable organic matter to inorganic mass.
- Reducing the volume and weight of MSW by 90 percent and 75 percent, respectively, thereby conserving landfill space.

However, burning garbage produces air emissions and ash residue. The Clean Air Act Amendments may adversely affect waste-to-energy plants because of their emissions, which may include combinations of dioxins, furans, SO_2, NOx, carbon monoxide, lead, cadmium and mercury.

Continued on page 27



Source: Kidder, Peabody & Co.

from page 24

Changing analog to direct digital controls...

tors should help with layout and operational graphics. Every plant is different, so it follows that the people who work with the unit on a day-to-day basis often know the kinds of information that help them handle various scenarios.

The supplier, conversely, because of intimate knowledge of his/her own equipment and system, should design the initial control graphics.

Graphics

The term "control graphics" identifies the bare minimum faceplate-type displays (see figure). These graphics should provide the best, most concise organization of control faceplates.

Operators should not have to learn a menu format or hierarchy. Getting from one place to another in the display system should be as intuitive as it was for the analog control board.

In the example shown, the display of typical Boiler Master software, the top menu represents plant areas. By selecting one area, the operator can get more information about that area, just as when walking to a specific part of the control board.

The graphic adheres to a specific format—the upper-right location represents the primary control parameter for that "page." Subordinate loops are in the lower portion, with the upper-left reserved for overall plant data. The operator can reference trends, too. The operator can move from one control to another with the arrow keys located at the bottom of the screen.

Operators accept this format rapidly because it is so similar in operation to familiar analog boards.

Plant philosophy counts

It is equally important to determine the overall plant operating philosophy early in a retrofit project. Where is the primary operator interface? As mentioned earlier, all pertinent operating information must be kept in relative proximity.

For example, if all plant switch functions are to be retained on the existing board, does it make sense to force an operator to control analog devices from the CRT? Just because a control system uses digital techniques does not necessarily rule out some panel-mounted stations.

Many control vendors offer digital stations with configurable capabilities. These stations retain aspects the operator has come to rely on and offer flexibility in design.

A compromise might move relevant switches into the digital control system and retain others on the board. If this is not done, all should be operable via the CRT system.

Immediacy

Operators must receive all critical information immediately, especially pertinent alarms. At the same time, nonessential alarms must be relegated to a lower priority and visibility.

Plant alarms are usually broken down into two distinct functions. Those alarms crucial to plant operation and safety are on the large, dedicated, board-mounted annunciator panel. The rest—usually referred to as (DAS) Data Acquisition System alarms—are recognized and engineered differently in a digital CRT-based system.

Designers should also dedicate CRTs for the critical alarm functions and not mix them with other functions.

Guide to computerized maintenance methods boosts productivity

NEW YORK—A new handbook will help engineers and managers understand and obtain the maximum benefits from computerized maintenance management systems (CMMS).

The handbook is designed to be a planning tool. It contains basic information, such as what a CMMS is and how it can be utilized. Advice on selection, purchasing, implementation, upgrading and using a CMMS is included, along with diagrams and checklists to guide users. A glossary of commonly used terms rounds out the book.

Research has shown that relatively few U.S. firms currently use CMMS, according to Adrian Salee, author of the *CMMS User Handbook*, who says most firms have yet to make major investments in CMMS technology. Yet, he adds, many anticipate computerizing their maintenance management procedures within the next three years.

The *1991 CMMS Directory and Comparison Guide* provides listings of more than 100 CMMS suppliers, with their capabilities and services. It also contains detailed comparisons of the software they offer.

The directory is divided into six major

Continued on page 30

from page 20

Waste burning...

Ash is collected in two main parts of a plant. The first is at the bottom of the boiler in which the garbage is burned. This "bottom ash" makes up about 90 percent of total ash produced.

The second is in the particulate-removal portion of the air-pollution-control equipment. This "fly ash" typically contains much higher concentrations of potentially toxic substances.

Copies of "Waste-to-Energy Industry: 1990 Awards: Business Remains Sluggish" cost $190; those of "Waste-to-Energy Industry: An Examination of Major Obstacles to Growth" cost $175. Both are free for subscribers to the "Kidder, Peabody Waste-to-Energy Database printout," which lists all projects identified in a survey in the U.S. and Canada and costs $365. Contact: Marion S. Brown, Manager-Information Services Marketing, Kidder, Peabody & Co. Inc., 10 Hanover Sq., New York, NY 10005; 212/510-3770.

On the Pile
or Around the Powerhouse...

...you never know what job will surface next. Handling and stockpiling coal is a challenge in itself, but those odd jobs that pop up around every corner can really drive a manager crazy!

Caterpillar has long been known for its track and wheel dozers, scrapers and wheel loaders which move mountains of coal to keep you ahead of the game. But Cat also makes several models of utility machines designed to handle those odd jobs.

Cat® IT12, IT18B and IT28B Integrated Toolcarriers. Each model can be equipped with four sizes of general purpose buckets, or a high-capacity coal bucket. They can do anything a wheel loader can, then perform an endless variety of tasks by switching to any of almost 100 different tools...forks, dozer blades, snow plows, brooms, material handling arms, or even a claw-like grapple called a Tire Hand. Equipped with a quick coupler, these machines can change tools in less than 30 seconds.

Cat 416, 426 and 436 Backhoe Loaders. Ideal for trenching and general excavation around the powerhouse, these units are truly tops in their class. They're easy to operate and feature on-the-go shifting in all gears for both two or four-wheel drive. Unlike most other makes, Cat Backhoe Loaders use load-sensing hydraulics which match hydraulic flow and pressure to work demands.

Call your Cat® Dealer today. He'll be glad to show you how these machines can help solve some of your most difficult problems.

CATERPILLAR

© 1989 Caterpillar

Inquire R.S. 10

EPRI, BPA host symposium with Soviets

PALO ALTO, CA—A symposium on high-voltage transmission was hosted by the Electric Power Research Institute (EPRI) and Bonneville Power Administration (BPA) with the U.S.S.R.

EPRI has had a long-standing relationship with the Soviet R&D counterpart (VNIIE) the All-Union Electric Power Research Institute. BPA also has had a working relationship with the Soviet Union.

The meeting was held in Palo Alto May 20-21 and in Portland, OR, May 22 with a field trip to the HVDC Celilo Converter Station.

Participants discussed the two countries' design and operation of transmission systems and shared technology that might be helpful for each.

BPA cofunded part of the meeting and participated to share information about its extensive transmission system and experience with 500-kV through 1100-kV lines.

The high-voltage network in the Soviet Union consists of 500-kV and 750-kV lines with capacities of 1800-2300 MW. In western, highly populated areas, the 750-kV network is superimposed over a 330-kV network, which has a capacity of about 300-400 MW.

In the south regions, the Soviets use 500-kV lines superimposed over a 220-kV network. The same philosophy is carried out in Siberia and Kazakhstan where the first 1150-kV lines have been constructed.

Future plans calls for the system to gradually migrate toward 1150-kV lines superimposed over a network of 500-kV lines.

Taking into account the large territory of the Soviet Union, and for the sake of economy, the 1150/500-kV system will normally use a single circuit as opposed to the U.S.'s and Canada's trend to use multiple circuits on a single structure.

By designing for only one circuit, the question of reliability is an important one for the Soviets. They use automatic reclosing in the most simple, cheap and effective way possible to achieve a reasonable level of reliability.

Three-phase automatic reclosing is used where arc quenching is a problem. Three-phase reclosing is used as the main type of protection for lines up to 110 kV where the chance of multiphase damage is relatively high.

The 220-kV lines and lines of higher voltage are equipped with combined automatic reclosing, which for a single-phase failure works as single-phase reclosing. Multiphase failures work as three-phase reclosing.

As voltages increase on Soviet lines, so does reliability. The 110-kV lines have an average of 3.0 failures/year for 100 km. Failures for other voltages are: 1.5 for 330 kV; 0.6 for 500 kV; and 0.2 for 750 kV.

There is lots of room for improvement. The Soviets admitted that many outages could be eliminated with more automatic reclosing. They estimated improvement of 60-90 percent for 110 kV; 70-85 percent for 287-550 kV; and 65-75 percent for 735- to 765-kV lines.

Outages are caused by similar things worldwide: lightning, other weather-related outages, insulation failures, wind, fire, galloping, equipment failure, etc.

A comparison of outages on 750-kV lines in the Soviet Union and Canada is shown in Table 1.

Table 1. Failures on 750-kV lines

Reason for failure:	USSR % caused by:	Canada % caused by:
Manufacturing, assembly, or maintenance	13.7	21.1*
Ice, snow, galloping	3.8	
Wind	20.6	
Thunderstorm	20.0	
Insulation breakdown	10.6	52.1
Fire, mechanical	13.8	5.7
Unknown	17.5	21.1

**includes first two reasons*

Other Soviet presentations

Other presentations by the Soviets included:

- Overvoltages, lightning surges and line protection.
- Electric and magnetic field limits.
- Radio and TV interference.
- Maintenance of insulators.
- Audible noise problems.
- Line and tower designs.

Soviet EF criteria

The limits for electric gradients for Soviet lines are shown in Table 2.

Table 2. Limits for electric fields

Locations:	kV/m
Inside living space	0.5
Outside houses	1.0
Populated areas outside house zone	5.0
Road crossings	10.0
Roads and agricultural zones	15.0
Inaccessible and guarded areas	20.0+

BPA presentations

Bonneville Power Administration en-

Continued on page 34

Bar coding controls inventory

ATLANTA—The General Shops at Alabama Power Co. (APC) have been using a bar code system since 1989. Edward C. DeMellier presented a paper at the recent Southeast Electric Exchange meeting in Atlanta describing APC's use of bar coding for inventory control of transformer and circuit breaker parts.

APC chose Code 39—one of four codes that are commonly used for inventory control and are applicable to transformer and circuit breaker parts. It was developed in 1975 and is rapidly becoming "the code" for industry and commercial applications.

In 1982 it was established as an official government standard (MIL-STD-1189A). The Automotive Action Group bar code standard also recommends Code 39. It is identified in ANSI standard MH 10.8M-1983. One of the reasons it has become so popular is its accuracy. The substitution error rate for Code 39 is 1 in 3,000,000 when used without a check digit and 1 in 45 trillion with a check digit.

DeMellier says that APC chose Code 39 because of its versatility. It uses both alpha and numeric characters and a variable length code that permits coding different data elements for entering into the inventory computer.

A table of valid account numbers—up to 24 alphanumeric characters long—was printed in bar code, laminated, and placed at the issues window. Now, when material is issued, the appropriate account number can be scanned.

DeMellier pointed out that devices for reading bar codes vary from the laser scanner used in grocery stores to the portable devices used by Federal Express.

Two basic approaches allow a bar code reader to be attached to a personal

Continued on page 38

Fleet standardization economic, but is not first choice for most

WILLIAMSBURG, VA—Should utilities standardize fleet vehicles?

Gary A. McAlexander, president, Baker Equipment Co. has been encouraging this idea for decades. His latest appeal was made at the Electric Utility Fleet Managers' Conference in June 1990. Subsequently, he and representatives from electric utilities and contractors debated this question at length.

After observing both manufacturer's design planning and actual field operations, McAlexander concluded that a unit that promises maximum production at the job site while offering the most requested options would best satisfy requirements and be profitable for the industry.

"Standardization would promote faster delivery, simplified training, higher quality, better parts service, lower administrative costs and lower acquisition costs," McAlexander said.

Duke Power's experience

Duke Power is often seen as a forerunner in establishing the standards of utility vehicles used by the industry today. Bill McElhaney, manager, transportation services, said that Duke Power entered into a joint venture with a contractor in 1971 to standardize the entire truck fleet. "The cost effectiveness made sense and the trucks would do the job we intended for them to perform," said McElhaney.

Duke recognized that the expense of ordering custom-space trucks was not effective. Today, all of Duke's vehicles have standard bodies with the only exception being the front-wheel drive vehicles needed for mountain terrain.

McElhaney said that formerly a job might take a 7-10 man crew but now takes only a crew of two because of the technological advances in standard equipment.

The process of standardizing for Duke took only one year to implement. "Acceptance of a new line truck is often a major issue for the crew," McElhaney said, "but the new arrangement was not difficult for others to accept. It actually made day and night shift worker transitions smoother for maintenance crews."

Contractor also benefits

Henkels & McCoy Inc. uses its nationwide operations as an opportunity to purchase standardized equipment inexpensively. James J. Lafferty, operations manager, said, "This way, we keep our internal equipment rates down and pass the savings along to our customers." Another advantage to large operations is that parts are readily available.

Training time for operators and mechanics is also a factor in standard equipment.

Georgia Power

Hans A. Hanson, superintendent of fleet support at Georgia Power Co. has followed the debate over standardization for nearly three decades. Hanson recalls 20 years ago when Georgia Power formed an auto study committee to implement a standardized vehicle program. Factors such as training, efficiency, cost effectiveness and parts stocking all pointed toward the benefits of standardization.

Once the program was implemented, total operating costs decreased. "Stan-

Continued on page 35

500-kV loop is finally underway

BALTIMORE—The remaining portion of the long-delayed Washington-Baltimore 500-kV loop is underway and expected to be completed in spring 1994.

Baltimore Gas & Electric Co. (BG&E) selected Black & Veatch to provide engineering design, environmental permitting, licensing services, and construction management for the 35 miles of line that will complete the 500-kV loop around Washington D.C.

One 18-mile segment will be jointly owned with Potomac Electric Power Co. (PEPCO) connecting BG&E's Calvert Cliffs nuclear generating station to PEPCO's Chalk Point fossil generating station.

The other 17-mile segment will link BG&E's Waugh Chapel substation to a 10-mile segment under construction separately from PEPCO's Brighton substation.

The Calvert Cliff-Chalk Point segment will include a 4500-ft crossing of the Patuxent River with four lattice towers located in the river. Bill Kilmon, project manager for BG&E, said lattice towers and steel poles will be used for both lines to match similar structures on adjacent rights-of-way.

Carl Boermer, Black & Veatch's project manager, said the 3-yr licensing, engineering, and construction schedule is ambitious, but achievable.

The North American Electric Reliability Council (NERC) says the Baltimore-Washington loop is required to provide adequate interregional transfer capability near the Mid-Atlantic Area Council's (MAAC) southern and western interfaces and to provide adequate stability margins in the Baltimore-Washington area.

The project has been delayed for years with siting, certification, and related court actions. NERC says such open-ended approval and judicial review processes threaten timely completion of other planned transmission facilities necessary to supply customer demand, particularly, in high-growth areas within MAAC.

PSI replaces wood H-frames with steel

PSI Energy crews replace 171 wood H-frame structures with new steel H-frames following spring ice storm. Steel was used because it was quicker and also for future upgrading of line

PLAINFIELD, IN—PSI Energy replaced the wood H-frames of a 230-kV transmission line in north-central Indiana with steel structures. The wood poles were destroyed in a massive spring ice storm (*ELP*, p.1, 5/91).

The shift to steel was partly because existing plans call for upgrading the line to 345 kV within the next 10 years.

Another major consideration was time. Arnie Poppens, senior engineer, PSI Energy, said, "We needed to restore service in the fastest possible time, so we asked Meyer Industries to initiate its LD Steel Express service. They had the materials on hand and the design was compatible with our specifications."

"Replacing the poles with wood would have required 342 poles, with over 200 of them in the 100-126-ft H-1 class range. Finding that many poles of that size quickly was unlikely at any price," said Poppens.

The 230-kV circuit linked the Cayuga coal-fired plant with the transmission grid and several key substations.

Ron Randle, vice president, Meyer Industries in Hager City, WI, said, "In addition to having a large stock of steel poles, we use an existing steel H-frame design that perfectly suited PSI Energy's requirements."

Construction crews were able to start replacement less than three weeks after the storm and expected to have the new line energized by July 1. Span length remains the same 875 ft on average, but the steel structures will be 15-ft higher—about 90 ft above grade on average.

The weathering steel poles will be direct-embedded with a crushed rock backfill.

Co-op upgrades EMS/DA system

MANASSAS, VA—Northern Virginia Electric Cooperative (NOVEC) is upgrading its energy management and distribution automation systems.

Advanced Control Systems (ACS), Atlanta, GA, is supplying a dual CPU-based HPM-7095 master equipped with HP A900 mini-computers. NOVAC will use existing CRTs and printers and will add three additional color CRTs and two printers. Software will include the ACS RDAC operating system, area dispatch software, historical data analysis, load-management software, and others. The system will have the capability of voltage reduction and residential load management.

from page 32

Symposium...

gineers made presentations on its single-phase switching of 500-kV system. The stability during fault interruption is improved through the use of single-pole switching (SPS). BPA has incorporated four distinct methods of secondary arc extinction for SPS among 26 lines on its 500-kV network.

BPA's limits and guidelines for EMF in Oregon is 9 kV/m anywhere within the right-of-way. Under normal conditions, the 550-kV lines have an average of 3.5 kV/m—low because of hilly or mountainous terrain.

For its 1200-kV lines, BPA has adopted the limits for electric fields shown in Table 3.

Table 3. BPA limits on electric fields

Location:	kV/m
In right-of-way	9.0
Edge of R-O-W	5.0
Road crossings	5.0
Shopping center parking lots	3.5
Industrial parking	2.5

BPA has taken the stance that since it will take several more years before sufficient scientific data are available to establish whether or not EMF is a threat to public or worker health, it won't change its present standards that were developed from regional law-making processes.

Other BPA presentations included:

- Sytem reliability considerations for parallel ac and dc links.
- Planning issues.
- Equipment and line performance.

Presentations by EPRI included its work at the Transmission Line Mechanical Research Center (TLMRC) which performs integrated design processes for transmission line structures.

Magnetic field design options were also discussed. EPRI funds a number of projects dealing with this currently popular subject.

Other topics by EPRI included:

- Diversity in planning criteria among power pools.
- Six-phase power transmission.
- Substation voltage upgrading.

A similar meeting is planned for January 1993.

Above 60 feet, wood poles come up short.

From 60 to 110-feet, Light-Duty Steel Poles were designed to replace wood, pole for pole, and save money. On new lines, where longer spans require fewer structures, LD Poles save even more. In either case, LD Poles slash annual maintenance costs and eliminate periodic replacement.

LD Steel Poles offer standardized designs in ten different classes. And we can ship from stock in 3 to 4 weeks. Guaranteed. For a free brochure, call or write "The Power Team" today.

AMERICAN ELECTRIC
STEEL STRUCTURES GROUP
MEYER INDUSTRIES
ANCHOR METALS
P.O. Box 114, Red Wing, MN 55066
Phone: (715) 792-2811 FAX (715) 792-5321

MEYER®
LD STEEL Express

Inquire R.S. 15

C69 85-6 A

ELECTRIC LIGHT & POWER
EL&P
AUGUST 1991
Volume 69, Number 8
A PENNWELL PUBLICATION
VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Tucson Electric Power creditors on July 16 petitioned for involuntary TEP bankruptcy reorganization, a move utility leaders hoped to avoid by cooperative restructuring. Such a filing could be the industry's largest and most complex—involving $2 B in TEP debt.

The nuclear industry is assessing the NRC's maintenance rule. Regulatory guidance starts in 1993; the final rule is effective in 1996. The nuclear lobby group NUMARC is raising questions; self-monitoring is preferred.

PacifiCorp/Arizona Public Service Co.'s agreement received final regulatory approval from FERC July 10. The deal includes PacifiCorp's $221-M purchase of APS' 350-MW, coal-fired Cholla 4.

The Chicago Board of Trade hopes to trade future contracts for the SO_2 emissions program.

Top 100 Electric Utilities
21st annual report starts on page 17

3 utilities agree to divide, reorganize Colorado-Ute

PacifiCorp, PS Colorado, Tri-State would swallow Chap.11 G&T co-op

Mark T. Hoske
News Editor

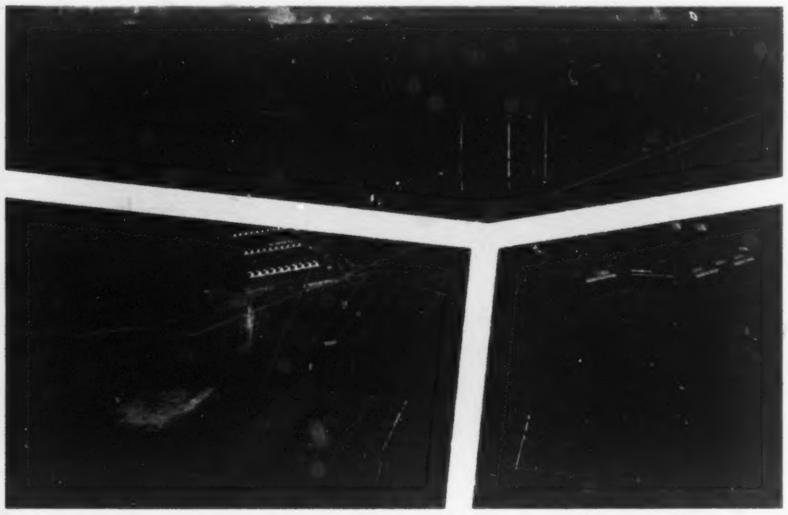
DENVER—Cooperation seems to be emerging from a scuffle over the assets and customers of Colorado-Ute Electric Association.

Three utilities agreed in principle to share the assets of Colorado-Ute after filing two conflicting plans for C-U's reorganization under Chapter 11 of the bankruptcy code. C-U voluntarily filed for protection in March 1990.

Cooperation among the three utilities came after the trustee for C-U recommended that they draft a consensual plan.

Previously, Public Service Co. of Colorado and PacifiCorp together filed a plan that conflicted with a plan filed by Tri-State Generation and Transmission Association. C-U members were split in allegiance to the plans (*EL&P*, p.3, 7/91). The utilities have withdrawn

Continued on page 7



Colorado-Ute's part of Craig and Hayden coal-fired plants may be divided three ways, with Tri-State leasing 408 MW, PS Colorado acquiring 332 MW, and PacifiCorp, 243 MW. The Craig plant is shown.

Utilities' heat-rate decline ends; fuel use, reserves fall

BARRINGTON, IL— The average heat rate posted by the nation's major electric companies rose slightly in 1990, to 10,636 Btu/kWh, for only the second break in the consistent decline that began in 1982.

At the same time, reserve margins continued to fall and use of coal and gas declined.

These were three of the primary results to come out of *EL&P's* 1991 Top 100 Electric Utilities Operating survey.

kWh sales up, coal use fell

Even though the Top 100 investor-owned electric utilities reported that their kilowatthour sales volume rose, they burned less coal and natural gas in 1990 than in 1989.

Results reversed

These results reversed last year's increase in the amounts of these fossil fuels used. The increases were confirmed by advanced statistics from the Edison Electric Institute.

Oil and nuclear fuel use increased to make up the difference.

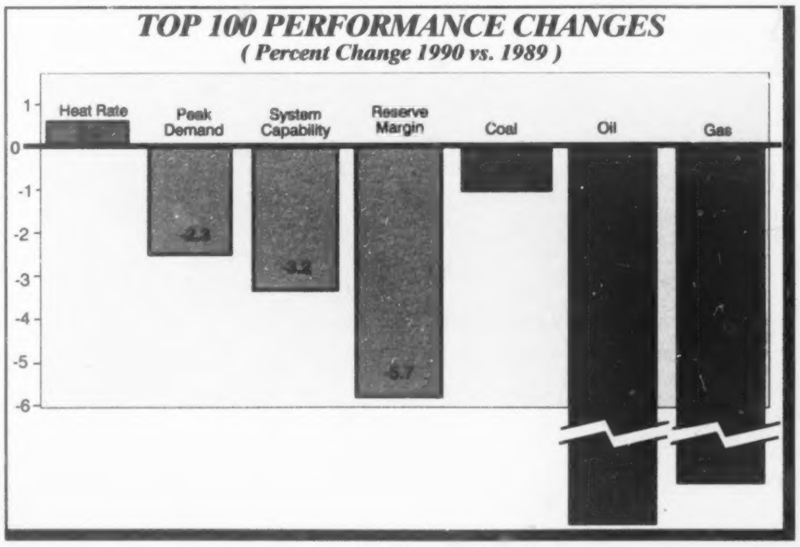
The average reserve margin for the Top 100 dropped again, as did total generating capability. Average system reserve margin declined to 18 percent in 1990 from 19 percent in 1989, but owned-reserve margin fell to 10 percent. These reductions took place even though the total of reporting utilities' '90 peak outputs fell below those of '89.

More lines

Transmission and distribution continued to grow in 1990 in all voltage and service categories.

The largest increase was in underground distribution line rated 22 kV and up, which increased 5.0 percent to 387,095 cable miles. Next-largest increase was in overhead distribution lines below 22 kV, which grew by 1.4 percent to 1,135,564 pole miles.

The smallest rise was where it may be needed most—in transmission lines—to balance service areas by allowing for power transfers. The Top 100 only added 1,199 circuit miles to lines rated below 189 kV and 1,656 circuit miles for those rated above 189 kV.



NRC to re-vote on relicensing rule
Is Yankee Rowe an aging test case?

WASHINGTON—After approving standards for 20-year plant-license extensions, the Nuclear Regulatory Commission decided it would look at the issue again.

At the same time, anti-nuclear forces have attacked the first target for the rule, Yankee Rowe nuclear plant. Yankee Rowe's license will expire in the year 2000. Relicensing and aging have ignited debate over the plant. Nuclear advocates maintain it's not a test case.

Fifty-six nuclear plant licenses will expire in the next 25 years, but many utility managements expected to get additional life out of existing nuclear capacity and avoid replacing that investment right away. Without relicensing, U.S. electric reliability could be strained; the 56 plants represent about 42 percent of nuclear capacity and 8 percent of U.S. electricity supply.

Yankee Rowe, with a highly touted operating record, is the oldest running commercial nuclear reactor in the U.S. But nuclear power opponents say the unit's vessel, holding the nuclear fuel, has become too brittle from years of radiation to safely withstand the cold-water shock of an emergency shutdown.

At a July 22 public meeting in Rowe, MA, NRC staff and Yankee Atomic were scheduled to discuss embrittlement, with the opportunity for public

Continued on page 7

*******************5-DIGIT 20814
4100127302*08019IP 000000 1186
SUITE 800 COPY # 1
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

NEWS BRIEFS

JILL MINNER, Special Projects Editor

FERC approves new service schedule for MAPP transactions

A new service schedule for Mid-Continent Area Power Pool (MAPP) transactions has been approved by the Federal Energy Regulatory Commission. MAPP says the new schedule will allow member companies to "shop in the market" for lower priced energy than may be available under present pool rates.

Under the new rate, called Schedule M-General Purpose Energy, members will be able to negotiate prices for energy sales to other members up to a formula-based maximum rate. Terms of the sale, including duration and delivery schedule, are also negotiable, according to MAPP.

FERC has also approved changing four other MAPP service schedules from a fixed demand rate to a ceiling rate based on a formula. This will allow buyers and sellers to negotiate a demand charge up to the ceiling rate, says MAPP.

MAPP, the North American Electric Reliability Council region, includes parts of Wisconsin, Minnesota, Iowa, Nebraska, North Dakota, South Dakota, Montana, Illinois and Michigan and the Canadian provinces of Manitoba and Saskatchewan.

Coalition to support natural gas imports

The Coalition for Diversified Gas Supplies has been formed by 40 natural gas distributors, interstate pipelines and electric utilities, in response to recent legislation in the U.S. Senate to impose additional restraints on Canadian natural gas imports.

"Canadian natural gas is an important source of energy for millions of Americans. Erecting barriers to this supply via anti-competitive legislation is threatening to the American economy and unfair to American consumers," stated Coalition Chairman Robert B. Catell, president and chief executive officer of the Brooklyn Union Gas Co.

According to the coalition, the natural gas portion of S.1220, a major energy bill that left the Senate Energy Committee last month, would put regulatory hurdles in place for imported gas under the premise that rate design differences discriminate against domestic suppliers. "This premise is false," said Catell, "as has been clarified in numerous regulatory proceedings and is demonstrated by the continued success of domestic gas in competition with Canadian supplies in the United States. This bill is an attempt to shield domestic producers from competition, at the expense of U.S. gas consumers, but domestic producers do not need this protection. Natural gas from domestic sources currently makes up the bulk of natural gas volumes purchased by coalition members, and will continue to do so."

Coalition members from the electric utility industry include: Central Hudson Gas & Electric Corp., Consolidated Edison Co. of New York Inc., Consumers Power Co., Edison Electric Institute, Fitchburg Gas and Electric Light Co., Long Island Lighting Co., New England Electric System, New York Power Authority, New York State Electric and Gas Corp., Ocean State Power Co., Pacific Gas & Electric Co., Public Service Electric and Gas Co., San Diego Gas & Electric Co., and Southern California Edison.

The coalition will "provide information to dispel the myths that supporters of the amendment seek to promote. We will advocate the right of distributors and pipeline companies to employ Canadian gas as an option for building diversified, reliable, cost-effective portfolios to meet the needs and expectations of their customers," explained Catell.

PTI forms new unit

Power Technologies Inc. and Nybro-Bjerck of Asker, Norway, have formed a jointly owned company, Hydropower Technologies Inc., according to PTI.

The new company, located in Schenectady, NY, will offer hydromechanical engineering consulting and software services for planning, design, and operation of hydroelectric facilities. Areas covered include: plant performance, conceptual design studies, unit load coordination, plant upgrading, plant and unit optimization, maintenance planning, education and training, and electrical and specialized hydromechanical technologies.

Michigan regulatory incentives study results released by NARUC

The National Association of Regulatory Utility Commissioners has released Phase I of its three-phase review of the Michigan Public Service Commission's regulatory system and its effects on resource selection by electric utilities that the PSC regulates. The report on the Michigan Regulatory Incentives Study was conducted by Barakat & Chamberlin, with financial support from NARUC, the Michigan PSC, Detroit Edison Co. and Consumers Power Co.

According to the report, Michigan is one of many states that does not have any policies or mechanisms to offset the DSM-induced loss of base revenue between rate cases. Consumers Power Co. does, however, have a performance-based DSM incentive mechanism for its energy conservation program. Under the program, the company collects a bonus for each kilowatthour saved above target levels. Although the incentive mechanism does not make conservation profitable, it shows that the commission is willing to link earnings to DSM performance, according to the report.

NARUC's report also analyzed three financial incentives: capitalization of DSM expenses; an electric revenue adjustment mechanism (ERAM); and shared benefits or shared savings. The report found that ERAM in Michigan would require major regulatory changes and may meet with significant public opposition.

Phase II of the study will involve Consumers Power and Detroit Edison conducting independent assessments of the three options in the first phase, according to NARUC.

Copies of the 128-page report are available for $15 from NARUC, P.O. Box 684, Washington, DC, 20044.

Alliance reacts to WEPCo ruling with 'cautious optimism'

The Alliance for Acid Rain Control and Energy Policy expressed "cautious optimism" in reaction to EPA's proposed regulation exempting most pollution-control modifications to existing electric utility power plants from new source review, according to Wyoming Gov. Mike Sullivan, co-chairman of the alliance (see *EL&P*, p.1, 7/91).

"If the EPA makes this proposal final, it will resolve many questions that utilities have voiced about how to operate under the new acid rain law. More importantly, it will mean that utilities can choose the least costly and most environmentally desirable technologies to comply with the law," Sullivan noted.

"We're really dealing with two distinct issues here. It has been the Alliance's position that forcing the use of scrubbers in controlling sulfur dioxide emissions makes neither environmental nor economic sense because there already exists a national cap on sulfur-dioxide emissions," he continued. "We applaud the EPA for realizing that requiring new-source review for plant modifications for SO_2 emissions has no adverse environmental impact."

"Unfortunately, the ruling goes too far in that it exempts plants from new source review for NOx and particulate emissions for which an emissions cap does not exist. This could slow environmental progress in reducing emissions of these pollutants. Had the ruling been limited to sulfur dioxide only, we would have been happier, but on balance this ruling means progress," Sullivan concluded.

According to Wisconsin Governor and Alliance Co-Chairman Tommy Thompson, "This decision clears the way for utilities to switch over to environmentally sound low-sulfur coals without having to face a costly review process by the EPA. Requiring the use of scrubbers or other SO_2 reducing technologies whenever a plant wants to modernize would translate into increased electric rates for consumers while providing no real environmental benefits."

Scientific Columbus changes name

Scientific Columbus Inc. recently announced that it has changed its name to Jemtec Electronics Co., to more clearly communicate the nature of its business. The company said the new name will be phased in over the next several months.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Carolina Power & Light
An $87,500 fine for three violations of NRC requirements at the Brunswick Steam Electric Plant. NRC Regional Administrator Stewart D. Ebneter said the violations "represent a continuing human performance problem that is of serious concern to the NRC."(see *EL&P* 6/91, p.2)

Gulf States Utilities Co.
A $37,500 fine for alleged violation of NRC requirements at the River Bend Station. The utility was cited for not maintaining barriers to a high radiation area and for an incident of improper worker practices.

Tennessee Valley Authority
A $75,000 civil penalty for alleged violation of NRC requirements at the Sequoyah nuclear power plant. The violation involved an air-start accumulator on an emergency diesel generator that was depressurized to a low level and that plant operators had not responded to an alarm indicator in the control room alerting them to the problem. The NRC said the condition existed for up to two hours before any action was taken.

Yankee Atomic Electric
A $50,000 fine for alleged violations that were found after one of the emergency diesel generators failed to start during a routing surveillance test at the Yankee Nuclear Power Station.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Three utilities compromise in plan to divide Colorado-Ute. **1**
Sides square off for nuclear relicensing; Yankee Rowe test case? **1**
Consumers Power uses satellite technology to save on hydro planning. **3**
APPA supports PUHCA protection; releases "Project 2000". **11**
Top 100 investor-owned utilities use less fuel, reduce reserve margins. **1,17**

T&D TECHNOLOGY

Fleet survey indicates efficient operations. **22**
Computer architecture should be standardized. **22**
Meter program saves $42k annually. **26**
EMS seminar focuses on future. **27**

GENERATION TECHNOLOGY

Seal replacement eliminates combined-cycle plant downtime. **30**
The solid-oxide fuel cell may be on the way to commercial reality. **30**
Operator computer games help to sharpen skills. **33**
Dam retrofit goes beyond the call. **34**

REGULAR FEATURES

Commentary and **Letters** **4**
Labor/Management Concerns **12**
Marketing **13**
Financial Performance **14**
Information/Control Systems **28**
Readers' Service **33A**
New Products **38**
New Literature **41**
Regulatory Review **43**
Management Methods **44**
Calendar **45**

COMMENTARY

Electricity offers 'solutions'

Over the past few years electricity has been accused of being a prime contributor to acid rain, global warming (if there is such a thing), destruction of the ozone layer, and air pollution in general. So it is with some real interest that we reviewed Mark Mills research report on *Ecowatts* (p.9). Mills' analysis of manufacturing and business operations revealed a number of areas where electrical usage not only was "as good" as other energy sources but was environmentally superior. Restricting his analysis to CO_2, Mills reported that while U.S. Gross National Product has surged more than 50 percent since 1973, emission of CO_2 has increased only 7 percent. CO_2 emission has fallen from four pounds per dollar of GNP in 1973 to 2.34 pounds per dollar in 1990.

Mills argues that while reducing wasteful, inefficient use of electricity only makes good sense, blind pursuit of ever-lower kWh-use may be environmentally counter-productive. In this, he disagrees strenuously with Amory Lovins, leading proponent of the less-is-best *Negawatt* philosophy.

Enough arguing. Let's assemble the proponents of the many diverse philosophies affecting energy-use and charge them to come up with a single, non-adversarial policy by which energy plans can be evaluated for economic and environmental optimization—an energy/environmental summit meeting. It seems to work in international politics; why not for domestic energy use?

Gas up Shoreham, Rancho Seco?

Two of the nation's nuclear plants—Shoreham, built but never operated by Long Island Lighting Co., and Rancho Seco, owned but no longer operated by the Sacramento Municipal Utility District—have been mentioned recently as prospects for changeover to gas-firing. Odds on the two developments occurring are about 7-3 *for* Shoreham, but 9-1 *against* Rancho Seco conversion.

Shoreham is about to be acquired by the Long Island Power Authority (LIPA), a 2-year-old state-owned entity created to purchase the nuclear plant and to furnish substitute power to LILCo. LIPA says a recent study showed that an investment of about $215 million to convert Shoreham to run on natural gas would save ratepayers about $80 million through 2013, compared with LILCo's resource plan. In other words, according to LIPA, an additional investment amounting to something less than 4 percent of current investment in the NRC-approved concrete and steel monument could turn it into 413 MW of useful capacity to provide electricity to LILCo's customers.

If engineering and bidding back up the projections, customers who will pay Shoreham's cost anyway, may get something good in return. For LILCo customers, the choice is between accepting Shoreham costs in guaranteed higher rates and having a questionable power supply, or absorbing Shoreham costs, paying higher rates *and* gaining an abundant supply of electricity. (Preservation as a nuclear plant remained a long-shot option as of July 24.)

For Rancho Seco, it's a totally different situation. SMUD General Manager David S. Freeman calls the plant "dead," with no chance for return to operation on gas or anything else. Freeman's position is based on his desire to avoid massive investment or reliance on any single energy resource. Repowered to burn natural gas, Rancho Seco's 660-MW capacity would represent about a third of SMUD's total capacity...too much to maintain system reliability, Freeman says. And with the prospect of natural gas prices rising rapidly after 2000, he believes his plan for a diversified base of renewable and NUG power provide a better chance of ensuring a satisfactory power supply and holding rates down. But SMUD customers still will be saddled with nuclear debt...and nothing to show for it, which seems to be questionable economics at best.

Consumer advocate will be missed

The industry has lost a long-time supporter of public power. Vic Reinemer died last month. A long-time assistant to Sen. Lee Metcalf (D-MT), and Editor and Publisher of *Public Power*, Vic believed deeply in the benefits of public power. We debated the values of a pluralistic electric system and the financial performances of major investor-owned electric utilities many times before his 1988 retirement. Things haven't been quite so lively since. He'll be missed.

EL&P
ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher

Robert A. Lincicome
Editor-in-Chief

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
Dianne Wilson, Editorial Assistant-Products/Literature
B. J. Davidson, Bulletin Board Coordinator
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1990 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.); $73 (foreign); $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402, (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP

Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

Greenhouse gas and lighting

We are quite concerned about the message the [Phillips Lighting] ad portrays (*EL&P*, p.5, 5/91).

To quote the text of the ad, "This in turn eliminates over 1500 pounds of greenhouse gas emissions that contribute to the global warming problem." While we have no quarrel with Phillips Lighting marketing their light bulb, we would prefer that they not market it under the assumption that global warming is occurring and that coal-produced gases are causing the earth to warm. Utilities such as Minnkota, who[sic] are nearly 100-percent coal-based generation utilities, have a strong concern over the economic consequences of such an assumption.

I believe that if you talk to credible scientists who have spent a significant amount of time researching this issue, they would tell you that the assumption that global warming is occurring is suspect. Also lacking any credible evidence is the idea that carbon dioxide has caused or will cause the earth to warm.

Because your magazine banner indicates you are "The voice of the electric utility industry," I would encourage you to be more selective on ad placements in your magazine. This ad, I believe, does not represent the electric utility views on the issue.

David W. Loer
General Manager
Minnkota Power Cooperative, Inc.

Editor's note: While we screen advertisements for violations of legal and moral principles, we are duty bound to publish the message of any utility, supplier, organization or group that passes that review. As we would not be censored, we will not censor others unless we determine their message to be libelous, illegal or immoral. We may not agree with or endorse an advertiser's message, in whole or in part, but except for those moral/legal violations, we will defend anyone's right to an opinion or view, and the right to express it. We continue to publish the debate on both sides of the global-warming theory.

Appliance recycling

I'm concerned that the article in your March issue describing Northeast Utilities' appliance recycling program may have left a false impression with your readers regarding the origins of the program.

Wisconsin Electric Power Co. in 1987 designed to its own specifications the first large-scale appliance turn-in program in the country. Your article implies that Appliance Recycling Centers of American (ARCA) developed this program for Wisconsin Electric. That is incorrect.

Appliances are removed from customers' homes by independent trucking firms that include non-profit and community agencies. ARCA removes the chlorofluorocarbons and transports the white goods to a scrap shredder. ARCA also removes the capacitors, which may or may not contain PCBs. The capacitors are placed in containers, which Wisconsin Electric then transports to an EPA approved site where they are incinerated according to EPA standards.

In January, Wisconsin Electric received the National Wildlife Federation Environmental Achievemenent award for recycling nearly 200,000 old, inefficient refrigerators, freezers and room air conditioners through our Appliance Turn-in Service.

I hope this information clarifies the origins of our progam for your readers.

Robert Link, Asst. VP-Marketing
Wisconsin Electric Power Co.
Milwaukee, WI

Editor's note: Sorry if we inadvertantly confused the issue of who launched the first appliance turn-in program. Congratulations to Wisconsin Electric for their achievements.

New substations expand operating flexibility at WEPCo

PHILADELPHIA—United Engineers & Constructors International (UE&C) will provide engineering and construction services for the $10.4-million substation expansion and upgrade program of Wisconsin Electric Power Co. Goal of the program is to improve operating flexibility in WEPCo's upper Michigan service area.

UE&C was awarded the contract from ABB Power T&D Co., the prime contractor for the project, to engineer and construct two new 345-kV substations on the upper Michigan peninsula, plus modifications to a 138-kV substation.

ABB Power T&D will provide electrical equipment, relay engineering and project management. One of the new substations will be near WEPCo's generating station at Presque Isle, MI, and the other at the site of an existing substation about 90 miles south at Quinnesec. Modifications will be made at the Presque Isle Power Plant switchyard.

Southern Co. to install advanced EMS

MELBOURNE, FL—Harris Corp. was awarded a $35.5-million contract from Southern Company Services for an energy management network. Headquartered in Birmingham, AL, SCS provides technical and specialized services to Alabama Power, Georgia Power, Gulf Power, Savannah Electric and Power, Southern Nuclear Operating Co., Southern Electric International, and The Southern Investment Group.

The energy management network will provide primary control and coordinate power production and transmission activities, support the evaluation and scheduling of power exchanges between neighboring utilities, and provide online security. It will have a disaster recovery capability to provide backup from a failed system to a designated recovery system.

ENSR offers 10-yr warranty on cleaned-up transformers

CANTON, OH—ENSR Operations, a supplier of PCB services, now guarantees that its System 50 reclassification technology on serviced transformers will not fail for a period of 10 years. If failure does occur, a pro-rata refund of the service cost is made.

More details are available from ENSR Operations PCB Hotline, 216/430-4543.

Higher electrical use can cut greenhouse gas releases

SAN DIEGO—Increasing use of electricity could reduce adverse environmental effects, not increase them, according to a Maryland consultant. He talked with members of the press during the Edison Electric Institute's Annual Convention here in June.

Moreover, said Mark Mills, Science Concepts Inc., in addition to reducing environmental degradation, overall efficiency of energy use is improved by replacing inefficient energy applications with electrical energy at point of use.

For example, he declared that sending a 20-page fax transmission coast-to-coast results in a 95-plus percent improvement in energy efficiency compared with overnight-express delivery, and eliminates two pounds of CO_2 discharge into the atmosphere as well.

Arguments that *reducing* electrical use will improve the environment are wrong, Mills explained. These arguments, he said, presume that since electric utilities consume the most fuel of any industry—36 percent, to make electricity—reducing kWh use will reduce fuel use...especially coal and oil ...and result in a cleaner environment.

The premise is simply wrong, he argued. Since 1973, the U.S. Gross National Product has grown more than 50 percent, while emission of CO_2 has increased only 7 percent. In other words, he suggested, if global warming is fact, then the U.S. economy's contribution to warming actually has *declined* by one measure, from four pounds of CO_2 per dollar of GNP in 1973 to 2.34 pounds per dollar of GNP in 1990.

"And it came at a time when nearly two-thirds of the economic growth was fueled by a 380-million-ton increase in coal consumption," Mills said.

This overall improvement is the result of using Ecowatts—the result of what happens when electricity displaces fuels, supports economic growth and improves the environment. He admitted disagreement with Amory Lovins, leading proponent of pursuing the *Negawatt*, the overall reduction of electrical use resulting from more efficient applications.

Mills suggests that following the Ecowatt path can help reduce global warming. For example, for each pound of steel produced electrically, two pounds of CO_2 are eliminated. Similar reductions in CO_2 production result when the ink on 40 magazine pages is dried with electrically powered ultraviolet heat, instead of a gas flame; a typical home is heated with a heat pump for two hours; an electric car is driven nine miles. These savings, he says, include the fuels used to make the electricity.

Other functions producing two-pound CO_2 savings include the following (total energy savings is given in parentheses): mowing a lawn for two hours with an electric mower instead of one powered with gasoline (30 percent); cooking a two-pound meatloaf in a microwave instead of a gas oven (90 percent); dry the paint on one new car with UV instead of gas heat (90 percent); securing one pound of toxic waste by electric vitrification instead of transporting/digging/burying (20 percent) and make 12 glass bottles in an electric furnace instead of a fuel furnace.

Many hundreds of new technologies that can further reduce adverse environmental effects and improve overall energy efficiency currently are under development. These include acoustic refrigeration, halogen cooking stoves, light-rail transportation, smart windows, electron-beam welding, membrane filtration, acoustic mufflers, to name but a few, he explained.

Mills admitted that programs aimed at improving electric efficiency cost effectively, without adverse economic and social side-effects, have their place today. But he argues that preoccupation with *saving* electricity has blinded many planners and business/political leaders to what substitution of electricity for other fuels at the point of use can really do.

Moreover, he pointed out, a large part of the potential for demand-side management/negawatt programs either is theoretically feasible, but is not economic or appears to be feasible, but no plans for implementation have been made. Between 1990 and 2000, he said, of 220 GW of potential DSM resources technically available, only 25 GW appear likely to occur.

Corrections and amplifications

# Several errors appeared in the Top 100 Electric Utilities report (*EL&P*, 6/91, pp. 21-24):

On page 21, the Earnings-Per-Share ranking of Florida Progress Corp. erroneously duplicated that of FP&L Group, its neighbor to the South. Florida Progress Corp. actually provided 1990 per-share earnings of $3.21, a decrease of 12.53 percent from 1989's $3.67 and should have ranked 70th on our list, not 98th as published.

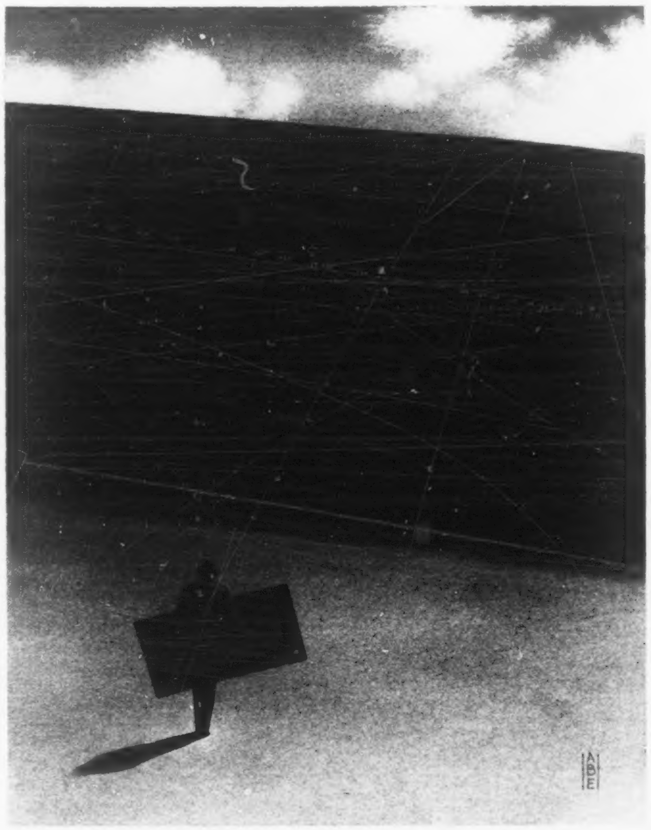
Also, Florida Progress' Net Income for 1990 was $164.8 million, not $64.8 million as printed (p.24 table).

In the text about kWh sales growth (p.22), Cincinnati Gas & Electric's 15.2 percent increase resulted in total sales of 22,006-million kWh, not 13,600-million kWh.

Several listings of Wisconsin Public Service Co. were in error (pp.23, 24).

Somehow, some of the percentages of revenues from electric operations, generally those from New England Electric System and below on the alphabetical listing were off by a factor of 10.

# A typographical error grossly exaggerated the capital cost of PSI Energy's compliance to the Clean Air Act Amendments of 1990 (*EL&P*, 7-91, p.12). The company said it would spend about $1.6 billion to comply, on $1.7 billion in present plant value.



At ABB, everybody is paid to think.

There's no such thing as a bad idea, frivolous concept or embarrassing question at ABB Power T&D Company Inc.. Because we consider ourselves a "thought oriented" rather than "task oriented" company. Where everyone is a crucial part of our overall process.

Whether we're winding coils on transformers or assembling cutouts, we're thinking of ways to serve our customers better. Setting new goals and questioning methods. Challenging ourselves to make sure we continue to give you the quality and service you expect and deserve.

Being the leading manufacturer of T&D equipment in America and a world leader in electrical engineering, we never forget that the best today isn't automatically the best tomorrow. Just as we always remember, in an industry like ours, we can't afford to stop thinking, and you can't afford to buy from a company that has.

ABB Power T&D Company Inc.
High Voltage Switchgear
Power Systems
Relays
Small Power Transformers
Electric Metering Systems
Power Transformers
Systems Control and Load Management
Distribution Transformers
Capacitors

ABB Power T&D Company Inc.
Blue Bell, PA 19422

© 1991 ABB-Power T&D Company Inc.

ABB
ASEA BROWN BOVERI

Investor-owned 1st-quarter financing falls

ATLANTA—Investor-owned electric utility financing fell 14 percent in the first quarter of 1991, compared to the same period in 1990, said Ebasco Services Inc.

"Refundings" totaled $300 million, down from 975 million. New money financings increased 28 percent to $1.4 billion (see table).

Common stock issues increased significantly from $34.1 million to $531.2 million. The amount of long-term debt issued decreased about 45 percent.

For comparison, the financing for alternative energy projects was $455 million for cogeneration, but zero for wind and independent power, said Ebasco's "Analysis of Public Utility Financing."

Offerings of Securities by Investor-owned Utilities ($000)

Long Term debt	1,088,425	62	1,986,000	94	-45
Preferred Stock	145,000	8	75,000	4	93
Common Stock	531,188	30	34,125	2	1457
Total Financing	1,764,613	100	2,095,125	100	-16
Public	1,589,613	90	2,095,125	100	-24
Private	175,000	10	0	0	-
New money	1,434,613	81	1,120,125	53	28
Refunding	330,000	19	975,000	47	66
Competitive	375,000	21	550,000	26	-32
Negotiated	1,214,613	69	1,545,125	74	-21
Private	175,000	10	0	0	-

Surge protection market expands

NORTHPORT, NY—The 1991 edition of *U.S. Electrical & Electronic Surge Protection Markets* is expected to be completed this month. The first edition, published in 1989, included chapters on the markets for plugin, hardwired, utility, datacom, telecom and RF/microwave surge protectors.

For additional information contact Dennis Zogbi, World Information Technologies Inc., 24 Woodbine Ave., Northport, NY 11768; Ph. 516/754-5700, fax 516/754-5746.

---

from page 12

Employment cases...

made arbitration an even more attractive alternative. The Supreme Court ruled that an agreement to arbitrate employment disputes was enforceable even if the dispute was one which the employee could have otherwise presented to a jury. The *Gilmer* decision involved age discrimination, and due to its unusual facts, must be carefully reviewed by an employer considering entering into contracts requiring arbitration with its employees. But such contracts, if carefully drafted, will probably be binding.

Less expensive in time and money

In addition to avoiding the possible runaway jury, the arbitration forum is much less expensive, both in time and money, than court litigation. Arbitration virtually does away with the extensive pretrial discovery process inherent in litigation. Moreover, since arbitration applies evidentiary rules on a much more informal basis, many of the issues of contention in formal litigation do not arise.

Thus, unlike court litigation, an employer does not sustain substantial losses (attorney fees and court costs), even in cases he wins.

Arbitration also has its benefits for the employee. An employee who truly feels he has been unjustly treated by his employer may seek prompt corrective relief. Arbitration awards usually take but a few months. Court litigation is almost always a matter of years.

Costs for the employee are less. Although big verdict-seeking plaintiff attorneys may shy away from a simple arbitration case, an employee pursuing his dispute in arbitration usually will find it much easier retaining an attorney for the limited time the case takes. Also, as a group, arbitrators are usually sympathetic to an employee's claims.

Employers who once criticized the arbitration system should take a new look from today's perspective and consider the matter again. Although arbitration may not be the perfect way to resolve employment disputes, given the alternatives, many employers are finding it the best choice available.

---

from page 13

Selling efficiency...

more?" Quirk named just two:

Some environmentalists have criticized Con Ed's lavish "Enlightened Energy" prospectus, more than 38,000 of which had been distributed by early March. It is printed in full color on heavy, coated paperstock. The environmentalists may have overlooked "Printed on recycled paper" on the back cover.

The other static has come from an organization of large users—commercial and industrial accounts that call their group Multiple Intervenors. Their gripe is that, the way they read the plan, they'll have to bear a disproportionate share of the program's cost. That argument has yet to be resolved.

If the compliance equation had only one solution, you wouldn't need our combustion experience.

You operate in a new and complex compliance environment. No single approach covers your system. No single coal can meet all your system's needs.

That's why it makes good sense to talk to Consol.

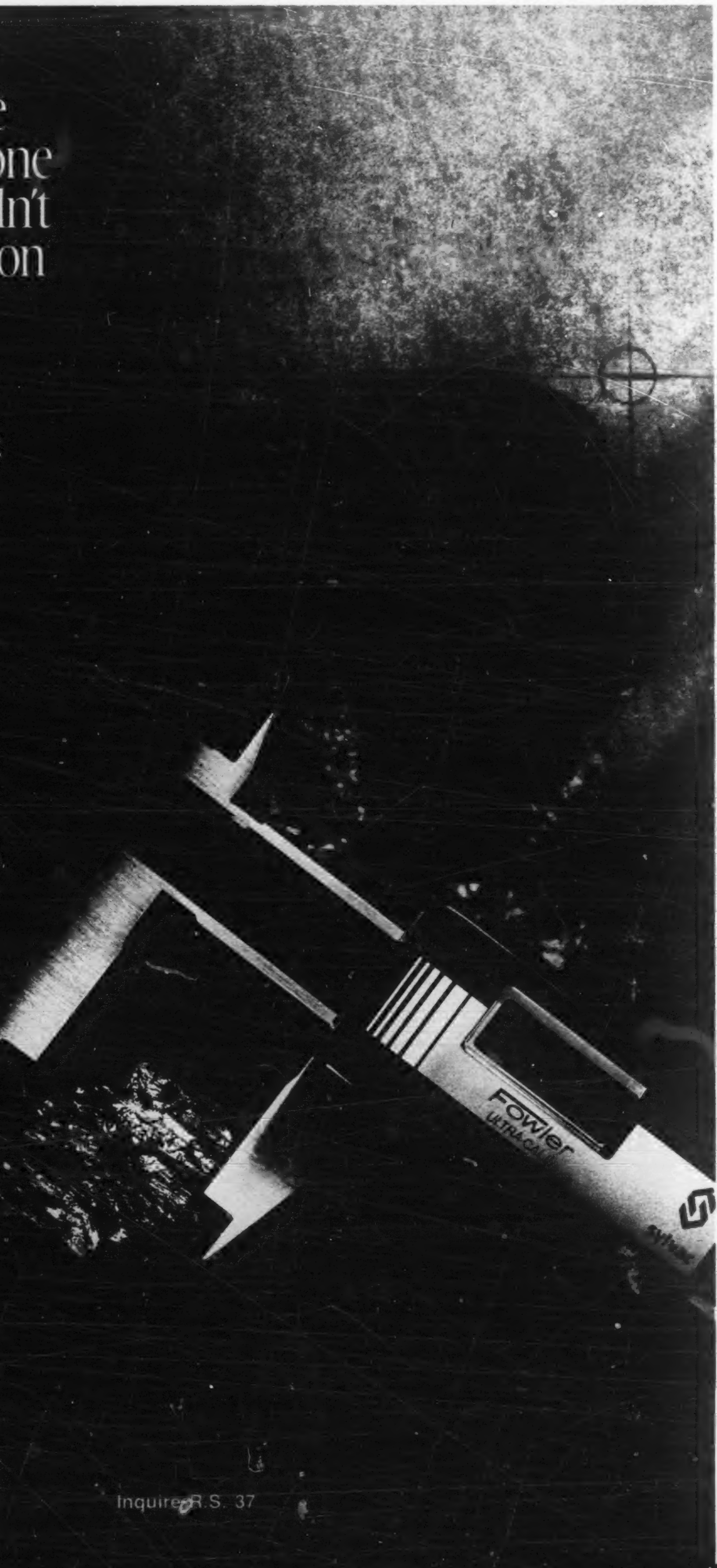
Our coal combustion research facility is the most advanced and comprehensive in the industry, and our expert engineers and scientists can analyze your system's compliance needs completely. We can simulate closely the operating conditions of your facilities and suggest the best options for system compliance. Or we can even pursue a "what if" analysis, varying conditions and coal blends to help you develop the most efficient compliance strategy for your facility.

Learn how Consol's unsurpassed technical expertise can help you find solutions to your equation. Write:
Consolidation Coal
Company-Consol
Plaza, Pittsburgh, PA
15241, USA. Or call
(412) 831-4000.
Telex: 247-634.

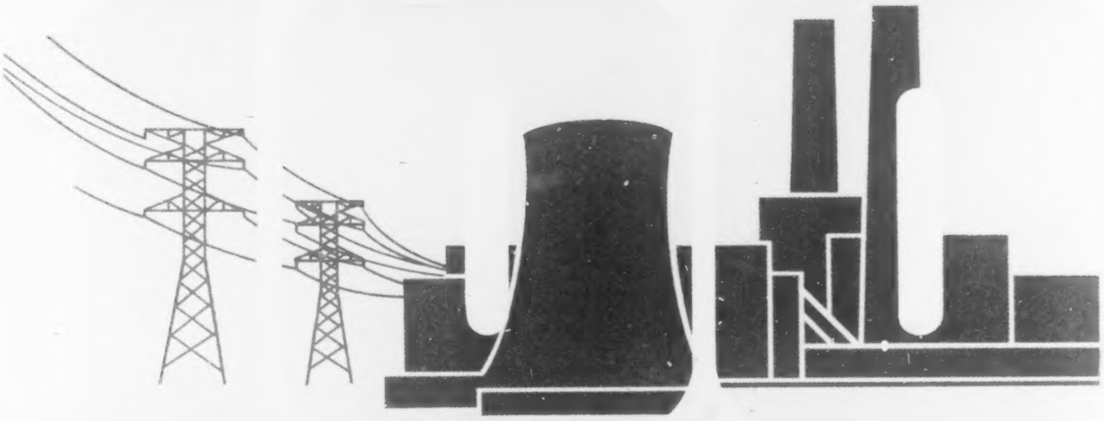
The New Face Of Coal.

CONSOL Consolidation Coal Company

Inquire R.S. 37



THE TOP 100 ELECTRIC UTILITIES



1990 OPERATING PERFORMANCES

Capacity margins, fuel use fall; heat rates inch up

Henry Stein
Senior Editor—Generation

The median heat rate for utilities reporting to EL&P's Top 100 Electric Utilities performance survey edged up slightly in 1990 from 1989, increasing for the second time in three years after seven years of steady declines ('82-'88).

The small changes from 1988 through 1990 suggest only that the overall downward trend in heat rates has bottomed out. The median heat rate for the reporting Top 100 was 10,601 Btu/kWh in 1990, which was slightly higher than 1989's median of 10,561 Btu/kWh. But this is a less than 1-percent change (as was the rise in average heat rate).

Importantly, Top 100 utilities used less fossil fuel in 1990 than in 1989, even though their kilowatthour sales rose by 2 percent (EL&P, June, p.21). At the same time, capacity margins continued to decline.

Fossil-fuel use by those responding to the EL&P survey was down in all three major categories (Table 1), or by approximately 1 percent for coal, a whopping 30 percent for oil and a large 25 percent for natural gas. Yet total electrical output was up 1.6 percent for the year, according to Edison Electric Institute figures, which suggests greater reliance on non-utility generators.

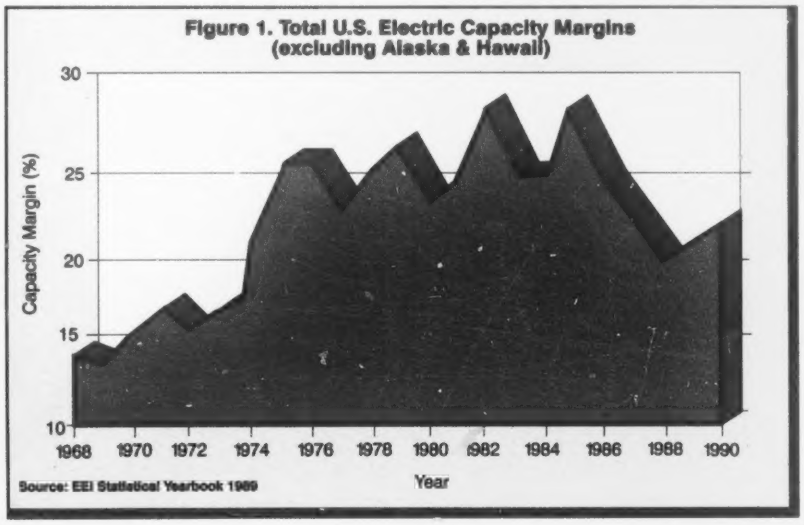


Figure 1. Total U.S. Electric Capacity Margins (excluding Alaska & Hawaii)

Source: EEI Statistical Yearbook 1989

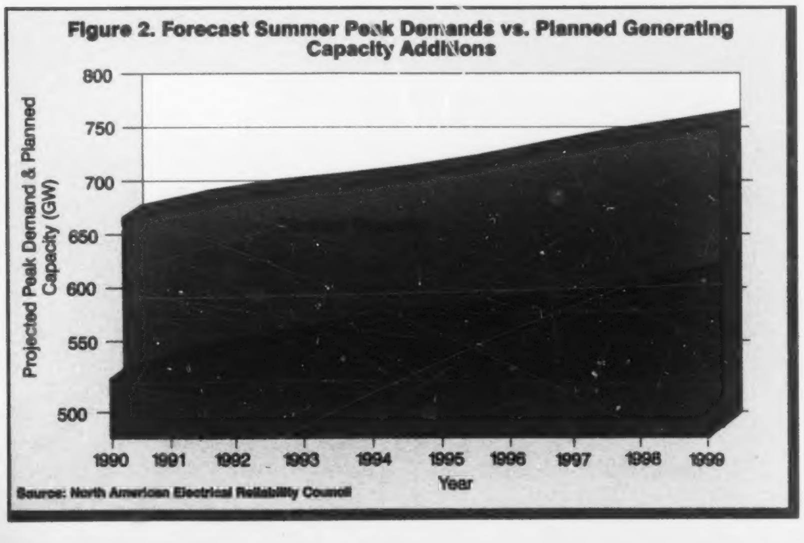


Figure 2. Forecast Summer Peak Demands vs. Planned Generating Capacity Additions

Source: North American Electrical Reliability Council

Top 100 overall

The fuel reductions reversed an '88-'89 increase in consumptions of all three types. Specifically, the changes in last year's report indicated that the coal burned in '89 was nearly 9 percent more than in '88, oil burned increased by almost 30 percent and natural gas by almost 21 percent.

The drop in oil consumption in 1990 was undoubtedly due to efforts by all electric utilities to reduce their dependence, no matter how small, on unreliable prices and supplies of what was formerly known as "liquid gold."

However, the consumption trends reported to *EL&P* for the three main electric utility fossil fuels are backed up by data from the Edison Electric Institute's advance statistics for 1990. EEI reported that although electric utility generation increased in 1990, a smaller percentage of the total came from coal, oil and natural gas. Coal's share dropped from 55.8 percent of total generation in 1989 to 55.5 percent in 1990, oil's from 5.7 percent to 4.2 percent, and gas's from 9.5 to 9.4 percent.

Nuclear and hydroelectric plants made up the difference in total electrical output. Nuclear power's share of generation climbed from 19.0 percent of the total to 20.6 percent and hydro's from 9.5 to 10.0 percent (in spite of the drought affecting parts of the country last year).

Margins

Still worrisome is the continuing downward trend in reserve margins by the Top 100 (Table 2). Their average reserve margin dropped again, from about 19 percent in '89 to 18 percent in '90, while the Top 100's average reserve margin for their own plants also decreased from over 12 percent down to just under 10 percent.

EEI's figures back this trend, showing an increase in total industry capacity margin in '89, which *EL&P* also reported in last year's Top 100 report (Figure 1). EEI's 1990 figures are expected to confirm the results of EL&P's study.

Meanwhile, the North American Electric Reliability Council's projections for 1990 through 1999 indicate the gradually narrowing gap between capacity and peak demand (Figure 2), from approximately 138 GW in '90 to about 120 GW in '99.

NERC calculated that summer capacity margins would fall from 22 percent in 1990 to a still comfortable 17.8 percent in 1999.

The Council went into more details in its *1991 Summer Assessment*, which presented and evaluated information for the U.S. as a whole, and for the 10 NERC regions, which include Canada and a small part of Mexico. The report assessed bulk electric supply conditions for June through September.

Peak demand in 1991 was projected to be 1.8 percent higher in the U.S. than last summer and 1.7 percent higher in Canada. But generating capacity was thought to be adequate, barring extreme weather or greater-than-expected outages.

NERC warned that power supplies may be inadequate for some subregions of the Southeastern Electric Reliability Council (SERC) and Mid-America Interconnected Network (MAIN), where capacity margins are lower than normally planned.

In addition, low reservoir levels could reduce hydro capability in the Fresno, CA, area. Utilities in the area implemented special operating procedures to maintain transmission loading into the area below emergency loading levels and to avoid voltage collapse in case of a transmission outage.

Utilities in the East Central Area Reliability Coordination Agreement (ECAR) expect that acid-rain compliance legislation will impact about 50 GW of capacity, reducing generation availability and indirectly hurting capacity through emission caps.

The U.S. has adequate baseload capacity today, but needs peaking and intermediate capacity, according to a Burns & McDonell Engineering Co. study presented at the American Public Power Association's 1991 Engineering & Operations Workshop.

Capacity additions currently contemplated are mainly gas/oil-fueld and will come from non-utility sources, the study said. Most of those planned are gas-fired, simple-cycle turbine units.

Burns & McDonnell forecasts that fossil-fueled, mainly pulverized-coal, steam units will supply baseload requirements, supplemented by fluidized-bed combustion plants burning refuse and low-quality coal. The company also predicted renewable resources would play a larger role in electricity production within this decade, but still would provide only a small percentage of total requirements.

As one example of where the electricity supply situation seems to be heading in many areas, Bonneville Power Administration said it might need another 750 MW by the year 2000, if demand continued to grow at the present pace in its area. Yet BPA's 750 MW is only about one-third of what the *1991 Northwest Conservation and Electric Power Plan* from the Northwest Power

[illegible]

Company	Rank	Heat Rate (Btu/kWh)	Up or Down	Coal (1000 tons)	Oil (1000 bbl)	Gas (1000 MCF)	Percent Change In Coal	Oil	Gas
Commonwealth Energy System*	1	9,616	U	0	6,663	1,566	0	-17	-41
American Electric Power*	2	9,777	D	46,205	541	0	3	-4	0
Cincinnati Gas & Electric	3	9,804	D	9,007	104	140	5	-16	-5
DPL*	4	9,881	D	5,616	37	308	-1	118	258
United Illuminating	5	9,921	U	958	4,863	2,737	12	-20	28
New York State Electric & Gas	6	9,936	D	6,395	18	0	-1	-28	0
Detroit Edison	7	9,940	-	18,891	312	18,146	3	-74	13
Allegheny Power System*	8	9,944	D	16,340	0	0	-4	0	0
Southwestern Public Service	9	9,974	U	8,266	8	40,377	1	-72	10
Potomac Electric Power	10	9,983	D	6,954	3,321	8,956	0	-48	-20
Florida Progress* (FPC)	11	10,005	D	5,781	10,245	3,654	3	-21	-32
Duke Power	12	10,009	D	10,217	162	831	4	-8	137
CMS Energy*	13	10,019	D	6,085	859	0	-7	-20	-100
Southern Company*	14	10,030	D	44,671	433	17,340	3	80	7
Public Service of Indiana	15	10,063	D	12,000	16	0	4	NA	0
New England Electric*	16	10,106	U	3,369	7,517	5,481	-5	-13	155
TECO Energy*	17	10,107	D	6,371	226	0	-6	82	0
Green Mountain Power	18	10,161	U	18	51	514	-39	-58	13
Cilcorp*	19	10,173	U	2,248	0	22	4	0	16
Central Hudson Gas & Electric	20	10,209	U	818	3,404	6,239	-6	-33	30
Union Electric	21	10,238	U	10,661	20	588	-1	-44	51
Pennsylvania Power & Light	22	10,249	D	10,802	2,634	0	-3	-60	0
Boston Edison	23	10,340	U	0	6,988	42,805	0	-31	16
Dominion Resources*	24	10,344	U	9,283	1,802	6,268	-16	-73	68
Centerior Energy*	25	10,351	D	8,569	227	20	5	-64	18
Idaho Power	26	10,368	U	3,199	1	0	2	-75	0
SCANA Corporation* (SCE&G)	27	10,375	U	4,207	6	6,150	-7	-71	196
Gulf States Utilities	28	10,416	D	1,951	22	175,534	0	10	8
Southern California Edison	29	10,417	U	5,318	3,182	140,250	4	-41	-24
Louisville Gas & Electric	30	10,431	D	4,881	0	44	9	0	-57
General Public Utilities*	31	10,446	U	7,552	1,170	10,875	-3	-54	-34
Kentucky Utilities	32	10,451	U	5,615	6	0	2	200	0
Central & South West*	33	10,456	D	16,980	178	206,458	5	-50	-5
IPALCO Enterprises*	34	10,474	U	5,727	90	0	3	84	0
Orange & Rockland Utilities	35	10,486	U	667	1,411	14,436	13	-34	12
Niagara Mohawk Power	36	10,510	U	3,420	11,555	22,560	-2	11	-19
FPL Group* (FP&L)	37	10,512	D	729	26,183	112,565	12	1	-14
Carolina Power & Light	38	10,514	U	7,963	203	306	-18	20	-6
Wisconsin Power & Light	39	10,519	U	4,079	17	219	14	-15	-5
Consolidated Edison	40	10,522	D	0	19,415	119,046	0	-33	30
PacifiCorp	41	10,535	U	23,062	88	1,049	3	-17	69
Oklahoma Gas & Electric	42	10,537	D	6,947	68	86,058	9	134	-8
Illinois Power	43	10,557	U	6,128	187	1,125	-6	-3	44
Midwest Resources*	44	10,575	U	5,818	22	1,259	132	-89	342
Pinnacle West Capital*	45	10,585	D	7,238	58	7,096	1	5	-64
Ohio Edison	46	10,590	D	10,820	24	31	-7	-24	0
Houston Industries*	47	10,601	U	16,378	204	250,569	-6	-56	4
Iowa Southern*	48	10,609	U	1,612	13	9	8	116	0
Rochester Gas & Electric	49	10,614	D	751	909	330	-9	10	-57
Bangor Hydro-Electric Company	50	10,622	-	0	281	0	NA	NA	NA
Portland General*	51	10,623	-	1,900	47	7,445	12	-37	-42
Public Service of Colorado	52	10,625	D	7,311	29	2,195	6	-42	-48
Northern States Power	53	10,632	D	11,775[3]	61	1,769	1	-26	21
Northern Indiana Public Service	54	10,651	U	6,547	0	5,987	-1	0	67
El Paso Electric	55	10,664	D	423	1	24,152	6	-96	-22
Tucson Electric Power	56	10,667	D	3,169	0	902	31	-100	-50
Utilicorp United	57	10,685	D	1,560	19	214	5	-88	143
Hawaiian Electric*	58	10,692	U	0	13,311	0	0	1	0
Central Louisiana Electric	59	10,696	U	2,202	0	27	6	-100	-8
Delmarva Power & Light	60	10,701	NA	2,381	1,966	5,310	-5	-53	-9
Kansas City Power & Light	61	10,729	U	6,290	37	111	10	-38	-43
Wisconsin Public Service	62	10,748	D	3,678	15	501	6	-17	-30
Baltimore Gas & Electric	63	10,755	U	4,507	4,072	8,475	-5	-28	8
Central Illinois Public Service	64	10,768	U	4,708	17	0	2	-11	0
Atlantic Energy*	65	10,793	U	1,050	666	2,548	-5	-55	-7
Central Maine Power	66	10,798	U	0	2,460	0	0	-31	0
Philadelphia Electric	67	10,834	D	2,572	3,394	1,762	-16	-43	-20
Wisconsin Energy*	68	10,835	-	8,381	56	769	NA	NA	NA
Montana Power*	69	10,839	U	3,718	23	279	-7	64	-15
St. Joseph Light & Power Co.	70	10,841	U	585	10	426	-6	-47	177
Southern Indiana Gas & Electric	71	10,851	U	2,405	0	142	-5	0	-21
Entergy Corp.*	72	10,873	U	5,354	1,439	201,051	-22	-22	11
Puget Sound Power & Light	73	10,880	D	3,280	11	135	-6	-94	-98
Kansas Gas & Electric	74	10,883	U	3,176	19	9,062	15	NA	-4
Iowa-Illinois Gas & Electric	75	10,895	D	2,485	8	356	-4	-11	19
Washington Water Power*	76	10,897	NA	2,075[2]	8	50	14	-11	9
Minnesota Power	77	10,931	U	3,884	0	0	1	0	0
Texas Utilities*	78	10,941	D	30,923	369	341,977	-1	-86	-3
Commonwealth Edison	79	10,972	D	10,005	1,506	269	18	11	-73
Nevada Power	80	11,003	D	2,421	260	6,404	-4	-15	13
Interstate Power	81	11,013	D	2,151	9	844	7	-10	11
Central Vermont Public Service	82	11,113	D	33[1]	47	139	-38	-36	1120
Public Service of New Mexico	83	11,147	U	3,698	0	242	-6	-88	-45
Empire District Electric	84	11,221	D	1,275	12	628	-84	-48	327
IE Industries*	85	11,344	U	950	27	NA	10	69	NA
KPL Gas Service	86	11,405	U	5,787	18	7,283	-7	-70	328
Otter Tail Power	87	11,510	D	1,933	4	0	-7	-100	0
Eastern Utilities Associates*	88	11,732	U	383	2,275	0	-26	-20	-100
Sierra Pacific Power	89	11,803	U	899	286	16,491	4	-20	7
Madison Gas & Electric	90	12,131	U	870	2	483	15	0	2
MDU Resources Group Inc.	91	12,173	D	1,517	4	137	-7	-50	954
Centel*	92	12,355	D	844	8	5,798	-4	-16	44
TNP Enterprises* (Tex-NM Power)	93	12,840	-	520	0	372	NA	NA	NA
Northeast Utilities*	94	INFORMATION NOT PROVIDED BY COMPANY							
San Diego Gas & Electric	95	INFORMATION NOT PROVIDED BY COMPANY							
Public Service of New Hampshire	96	INFORMATION NOT PROVIDED BY COMPANY							
Public Service Enterprise Group*	97	INFORMATION NOT PROVIDED BY COMPANY							
DQE*	98	INFORMATION NOT PROVIDED BY COMPANY							
Pacific Gas & Electric	99	INFORMATION NOT PROVIDED BY COMPANY							
Long Island Lighting	100	INFORMATION NOT PROVIDED BY COMPANY							

* Holding company
NA - Not Available/Not Applicable

[1] Wood [2] Coal & Wood [3] Coal, Wood & Refuse
0 (Change columns) - Less than 1% change and/or zero amounts in both years

Planning Council indicated the region as a whole might require. BPA currently provides half the electricity the area uses.

Gary Fuqua, BPA's acting assistant administrator for energy resources, said in June, "...this forecast reveals that if we lose part of our power base, or if we experience unusual growth, demand could outstrip supply in four of the next ten years."

Generation types

Those reporting to EL&P also confirmed the troubling, downward trend in capacity margins. Reporting utilities' total generation capacity declined from '89 to '90 (Table 3). Excluding the minor change in other types of generating capacity, the largest decline reported was a close to 12-percent drop in hydroelectric power, as might be expected from last year's lack of water to turn utility hydro turbines.

The drought in the Missouri River Basin was expected to continue, limiting its hydrogeneration. On the other hand, Hydro-Quebec's reserve improved, due to near-normal reservoir inflows, according to NERC. As a result, the Canadian utility removed the Tracy

TABLE 1.
FOSSIL FUEL CONSUMPTION

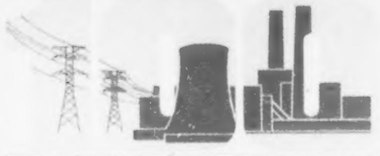
	1989	Change	1990	Change
Coal (million tons)	566	+8.7%	560	-1.0%
Oil (million bbl)	211	+29.6%	148	-29.8%
Gas (billion cu ft)	2,637	+20.8%	1,967	-25.4%

TABLE 2.
PEAK DEMAND AND RESERVE MARGINS

	1989	Change	1990	Change
Seasonal Peak (MW)	415,615	5.2%	406,160	-2.3%
Total System Capability (MW)	495,659	1.0%	480,029	-3.2%
System Reserve Margin	19.3%		18.2%	
Total Owned Capability (MW)	466,245	-0.4%	445,707	-4.4%
Owned Reserve Margin	12.2%		9.7%	
Average Load Factor	58.6		58.2	

TABLE 3.
TYPE OF GENERATION (MW)

Type	1989	Change	1990	Change
Conventional Steam	337,419	-1.4%	324,135	-3.9%
Nuclear	73,969	-1.6%	72,149	-2.5%
Combustion Turbine-Simple & Combined-Cycle	33,649	NA	33,599	-0.1%
Hydro & Pumped Storage	26,430	-1.5%	23,172	-12.3%
Other	4,339	NA	1,946	-55.2%
Total	475,806	-0.3%	455,000	-4.4%



thermal plant from supplying baseload generation and restarted sales of dual-energy contracts to commercial and industrial customers.

In the Western Systems Coordinating Council (WSCC) region, water supply conditions also varied by area. Water levels in the eastern part of the Northwest Power Pool were not good. The drought let up somewhat in the Arizona-New Mexico area, but generation in the Rocky Mountain area will be lowered from last year. Hydrogeneration also will be below normal in the California-Nevada area.

From the responses of those members of the Top 100 answering the survey, *EL&P* found their total nuclear output declined by 2.5 percent last year.

Heat rate leaders

The 20 most efficient fossil-fueled generating units with capacity factors above 50 percent were led by Colstrip-1 with a heat rate of 8610 Btu/kWh (Table 4). That pushed Central & Southwest's Comanche-1 unit out of its top place into No. 2, with its 8831 Btu/kWh rating.

Duke Power's Marshall-4 unit moved into the No. 3 spot; and Duke not only also claimed fourth place but, as in the past, also had two more, for a total of four, of the top 20 places in the listing.

Detroit Edison followed Duke in this respect, with two units in the top 20, as did Centerior Energy, Pennsylvania Power & Light and Florida Progress.

Rounding out the top-of-the-top compilations, Duke Power Company maintained its lead spot for having the best system heat rate of fossil-fueled boilers with a rate of 9468 Btu/kWh, which marks about the 15th year in a row as No. 1.

CMS Energy moved up to No. 2 in 1990 from 1989's No. 4 placing, while Cincinnati Gas & Electric took over No. 3, after placing No. 7 in last year's report. Continuing the leapfrogging, United Illuminating moved from No. 8 to No. 4, and Dominion Resources took No. 5, after not even being in the top 10 of 1989.

Heat rate improvements stop

Commonwealth Energy System moved up from '89's position of No. 2 to the top system heat rate spot (Table 6). And American Electric Power, Cincinnati Gas & Electric and New York State Gas & Electric all moved up one place, to Nos. 2, 3 and 4, respectively. Of course, they did so at the expense of previous No. 1 United Illuminating Co., which still showed up as a very respectible No. 5 with a heat rate of 9921 Btu/kWh.

Peak demand, down too

As already mentioned, the overall average reserve margin was still moving downwards (Table 2), just as it did in 1989. For although many system peaks went down, system capabilities went down even more. Total seasonal peak decreased by about 2 percent, but total system capability slid by about 3 percent. Thus, average overall system reserve margin for the Top 100 was reduced by nearly 1 percent, just between 1989 and 1990.

	Season Peak (MW)	Change (%)	Winter (W) or Summer (S)	Total System Capability at Time of Peak (MW)	Total System Reserve (%)	Owned Capability At Peak (MW)	Owned Reserve (%)	Load Factor (%)
Allegheny Power System*	6,070	-6.5	W	7,625	26	7,906	30	71.3
American Electric Power*	16,744	-5.4	S	22,107	32	22,254	33	67.2
Atlantic Energy*	1,741	2.4	S	1,954	12	1,409	-19	54.5
Baltimore Gas & Electric	5,477	3.1	S	6,634	21	5,457	-0	75.4
Bangor Hydro-Electric Company	251	NA	W	338	35	166	-34	78.3
Boston Edison	2,548	-3.0	S	3,475	36	2668	5	62.2
Carolina Power & Light	8,134	4.1	S	9,872	21	9,014	11	56.3
Centel*	INFORMATION NOT PROVIDED BY COMPANY							
Centerior Energy*	5,261	-3.1	S	6,597	25	6,597	25	63.6
Central Hudson Gas & Electric	871	-1.9	S	1,071	23	1,090	25	67.7
Central Illinois Public Service	1,657	4.5	S	2,459	48	2,647	60	55.5
Central Louisiana Electric	1,218	6.1	S	1,706	40	1,686	38	56.5
Central Maine Power	1,462	-5.4	W	1,930	32	1,103	-25	75.9
Central Vermont Public Service	386	-5.8	W	482	25	96	-75	67.9
Central & South West*	10,397	3.9	S	13,571	31	13,597	31	57.5
Cilcorp*	1,098	2.1	S	1,136	3	1,136	3	52.8
Cincinnati Gas & Electric	3,979	1.2	S	4,454	12	4,054	2	56.6
CMS Energy*	5,891	2.4	S	7,160	22	6,268	6	62.5
Commonwealth Edison	17,272	2.9	S	22,522	30	22,522	30	52.0
Commonwealth Energy System*	890	-3.2	S	1,156	30	198	-78	63.6
Consolidated Edison	8,388	-2.3	S	10,888	30	9,281	11	51.9
Delmarva Power & Light	2,235	0.9	S	2,503	12	2,503	12	61.0
Detroit Edison	9,032	3.8	S	9,953	10	9,948	10	54.9
Dominion Resources*	12,113	-4.6	S	13,647	13	11,832	-2	56.9
DPL*	2,643	3.4	S	2,657	1	2,657	1	57.9
DQE*	INFORMATION NOT PROVIDED BY COMPANY							
Duke Power	14,046	3.2	S	16,415	17	16,129	15	59.9
Eastern Utilities Associates*	850	2.3	S	1,146	35	614	-28	55.0
El Paso Electric	1,098	2.0	S	763	-31	1,498	36	66.7
Empire District Electric	668	4.7	S	787	18	642	-4	51.8
Entergy Corp.*	12,189	6.1	S	16,081	32	16,352	34	57.4
Florida Progress* (FPC)	5,946	2.0	S	6,927	16	6,041	2	53.4
FPL Group* (FP&L)	13,754	-1.7	S	10,896	-21	13,622	-1	55.3
General Public Utilities*	7,634	-1.0	S	9,140	20	6,870	-10	64.4
Green Mountain Power	302	NA	W	382	26	160	-47	69.5
Gulf States Utilities	5,388	6.9	S	6,453	20	6,392	19	64.4
Hawaiian Electric*	1,408	3.7	W	1,601	14	1,555	10	72.0
Houston Industries*	11,150	6.6	S	14,529	30	13,584	22	63.8
Idaho Power	2,168	-6.8	S	2,291	6	2,355	9	64.0
IE Industries*	1,005	1.4	S	1,260	25	1,081	8	55.7
Illinois Power	3,394	4.6	S	3,932	16	3,930	16	53.6
Interstate Power	1,700	89.7	S	1,054	-38	951	-44	61.9
Iowa Southern*	543	9.7	S	616	13	603	11	53.8
Iowa-Illinois Gas & Electric	1,055	0.2	S	1,273	21	1,424	35	53.0
IPALCO Enterprises*	2,498	4.7	S	2,883	15	2,829	13	54.8
Kansas City Power & Light	2,711	6.7	S	3,048	12	3,048	12	47.7
Kansas Gas & Electric	1,739	11.5	S	2,419	39	2,121	22	52.6
Kentucky Utilities	2,835	-2.9	S	3,355	18	3,150	11	56.5
KPL Gas Service	2,066	6.9	S	2,462	19	2,589	25	48.5
Long Island Lighting	INFORMATION NOT PROVIDED BY COMPANY							
Louisville Gas & Electric	2,149	6.3	S	2,281	6	2,281	6	50.7
Madison Gas & Electric	519	1.2	S	607	17	592	14	47.0
MDU Resources Group Inc.	382	-0.5	S	452	18	411	8	53.5
Midwest Resources*	2,274	130.9	S	2,720	20	2,394	5	49.2
Minnesota Power	1,248	-3.0	W	1,554	25	1,167	-6	85.0
Montana Power*	1,504	5.9	W	1,557	4	1,176	-22	62.0
Nevada Power	2,248	7.5	S	2,264	1	1,705	-24	50.2
New England Electric*	4,059	-3.9	S	5,331	31	3,988	-2	63.9
New York State Electric & Gas	2,491	-4.1	W	3,223	29	2,683	8	69.0
Niagara Mohawk Power	5,792	-9.2	W	7,596	31	5,625	-3	72.8
Northeast Utilities*	INFORMATION NOT PROVIDED BY COMPANY							
Northern Indiana Public Service	2,547	3.9	S	3,361	32	3,361	32	62.7
Northern States Power	6,733	3.0	S	7,815	16	6,793	1	57.4
Ohio Edison	5,394	4.7	S	6,195	15	5,828	8	65.0
Oklahoma Gas & Electric	4,584	7.9	S	5,703	24	5,703	24	48.3
Orange & Rockland Utilities	922	-2.0	S	1,157	25	1,005	9	53.5
Otter Tail Power.	562	-4.4	W	728	30	631	12	61.2
Pacific Gas & Electric	INFORMATION NOT PROVIDED BY COMPANY							
PacifiCorp	7,623	10.9	W	9,141	20	6,860	-10	64.0
Pennsylvania Power & Light	5,661	-5.7	W	7,912	40	8,329	47	62.4
Philadelphia Electric	6,756	4.5	S	5,673	-16	8,766	30	57.5
Pinnacle West Capital*	3,680	2.1	S	4,452	21	4,374	19	63.9
Portland General*	3,698	5.1	W	4,101	11	2,278	-38	51.5
Potomac Electric Power	5,442	3.8	S	5,909	9	5,459	0	52.4
Public Service Enterprise Group*	INFORMATION NOT PROVIDED BY COMPANY							
Public Service of Colorado	3,606	3.5	W	4,195	16	3,004	-17	63.7
Public Service of Indiana	4,573	7.0	S	5,783	26	5,627	23	56.5
Public Service of New Hampshire	INFORMATION NOT PROVIDED BY COMPANY							
Public Service of New Mexico	1,051	4.5	S	1,687	61	1,326	26	62.9
Puget Sound Power & Light	4,615	7.4	W	4,707	2	1,557	-66	48.0
Rochester Gas & Electric	1,208	-3.3	S	1,594	32	1,238	2	64.6
San Diego Gas & Electric	INFORMATION NOT PROVIDED BY COMPANY							
SCANA Corporation* (SCE&G)	3,222	2.5	S	3,707	15	3,891	21	57.0
Sierra Pacific Power	989	7.3	W	1,173	19	836	-16	70.9
Southern California Edison	17,647	12.9	S	20,840	18	14,078	-20	54.0
Southern Company*	25,981	6.5	S	28,576	10	29,390	13	56.6
Southern Indiana Gas & Electric	984	4.6	S	1,163	18	1,163	18	58.6
Southwestern Public Service	3,251	7.7	S	4,051	25	4,051	25	61.4
St. Joseph Light & Power Co.	324	4.5	S	390	20	360	11	50.4
TECO Energy*	2,630	-3.0	S	2,934	12	3,191	21	60.8
Texas Utilities*	18,007	5.0	S	21,949	22	19,928	11	55.8
TNP Enterprises* (Tex-NM Power)	INFORMATION NOT PROVIDED BY COMPANY							
Tucson Electric Power	1,356	4.0	S	1,314	-3	1,594	18	56.0
Union Electric	7,094	3.6	S	7,814	10	7,442	5	52.6
United Illuminating	1,055	-3.6	S	1,450	37	1,361	29	60.0
Utilicorp United	990	NA	S	1,341	35	947	-4	49.0
Washington Water Power*	1,591	-4.2	W	1,544	-3	1,300	-18	62.1
Wisconsin Energy*	4,499	NA	S	4,852	8	4,767	6	63.1
Wisconsin Power & Light	1,798	1.2	S	1,855	3	1,910	6	61.9
Wisconsin Public Service	1,516	0.8	S	1,769	17	1,709	13	72.6

* Holding company
NA - Not Available/Not Applicable

Company	Conventional Steam			Nuclear			Combustion Turbine**			Hydro & Pump Storage			Other	
	(MW)	(%)	Last Year Change (MW)	(MW)	(%)	Last Year Change (MW)	(MW)	(%)	Last Year Change (MW)	(MW)	(%)	Last Year Change (MW)	(MW)	(%)
Allegheny Power System*	7,089	89	85	0	0	0	0	0	0	902	11	0	0	0
American Electric Power*	20,865	87	0	2,130	9	0	18	0	0	836	4	0	0	0
Atlantic Energy*	792	49	5	373	23	0	441	27	82	0	0	0	9	1
Baltimore Gas & Electric	3,109	57	1	1,650	30	0	719	13	0	0	0	0	3	0
Bangor Hydro-Electric Company	111	66	NA	0	0	NA	0	0	NA	33	20	NA	23	14
Boston Edison	1,797	65	-3	669	24	2	296	11	88	0	0	0	0	0
Carolina Power & Light	5,102	57	0	2,676	30	0	1,018	11	0	218	2	0	0	0
Centel*	INFORMATION NOT PROVIDED BY COMPANY													
Centerior Energy*	4,305	65	-85	1,860	28	0	135	2	0	305	5	0	4	0
Central Hudson Gas & Electric	912	83	5	97	9	0	48	4	10	45	4	2	0	0
Central Illinois Public Service	2,644	100	10	0	0	0	0	0	0	0	0	0	3	0
Central Louisiana Electric	1,686	100	5	0	0	0	0	0	0	0	0	0	0	0
Central Maine Power	696	62	8	29	3	0	39	3	-4	366	32	25	0	0
Central Vermont Public Service	22	19	0	20	17	0	29	25	0	43	37	1	2	2
Central & South West*	12,276	87	23	630	4	0	524	4	2	0	0	0	714	5
Cilcorp*	1,106	97	0	0	0	0	30	3	0	0	0	0	0	0
Cincinnati Gas & Electric	3,579	88	0	0	0	0	475	12	0	0	0	0	0	0
CMS Energy*	4,028	64	-148	822	13	0	395	6	0	1,023	16	0	0	0
Commonwealth Edison	9,703	43	0	11,487	51	0	1,310	6	1	0	0	0	22	0
Commonwealth Energy System*	1,005	93	-19	25	2	25	38	3	-10	0	0	0	17	2
Consolidated Edison	6,228	68	-95	919	10	70	2,067	22	-9	0	0	0	0	0
Delmarva Power & Light	1,798	72	4	321	13	0	361	14	0	0	0	0	23	1
Detroit Edison	7,479	74	21	1,075	11	104	507	5	129	917	9	0	147	1
Dominion Resources*	6,185	50	-7	3,170	26	-10	1,441	12	535	1,592	13	0	0	0
DPL*	2,469	93	0	0	0	0	149	6	0	0	0	0	34	1
DQE*	INFORMATION NOT PROVIDED BY COMPANY													
Duke Power	6,994	43	259	7,054	43	0	599	4	0	1,647	10	195	0	0
Eastern Utilities Associates*	512	78	3	80	12	34	0	0	0	0	0	0	64	10
El Paso Electric	828	55	0	602	40	0	69	5	0	0	0	0	0	0
Empire District Electric	414	63	-21	0	0	0	228	35	0	16	2	0	0	0
Entergy Corp.*	12,108	73	0	3,797	23	0	528	3	0	70	0	0	6	0
Florida Progress* (FPC)	4,152	63	0	744	11	52	1,675	25	230	0	0	0	0	0
FPL Group* (FP&L)	8,379	62	7	2,885	21	0	2,344	17	0	0	0	0	14	0
General Public Utilities*	3,657	53	0	1,428	21	0	1,480	22	1162	305	4	0	0	0
Green Mountain Power	14	11	1	0	0	0	75	57	-4	36	27	0	7	5
Gulf States Utilities	5,592	90	-655	655	10	0	0	0	0	0	0	0	0	0
Hawaiian Electric*	1,268	82	-10	0	0	0	130	8	1	0	0	0	157	10
Houston Industries*	11,404	84	-30	770	6	0	1,410	10	0	0	0	0	0	0
Idaho Power	996	35	4	0	0	0	50	2	0	1,773	63	43	0	0
IE Industries*	538	50	20	375	35	7	163	15	1	0	0	0	6	1
Illinois Power	3,340	78	0	807	19	0	138	3	0	0	0	0	0	0
Interstate Power	896	94	0	0	0	0	44	5	0	0	0	0	11	1
Iowa Southern*	574	95	0	0	0	0	27	4	27	0	0	0	6	1
Iowa-Illinois Gas & Electric	907	64	0	385	27	0	129	9	31	3	0	0	0	0
IPALCO Enterprises*	2,755	97	0	0	0	0	6[illegible]	2	0	0	0	0	14	0
Kansas City Power & Light	2,128	70	23	533	17	0	387	13	0	0	0	0	0	0
Kansas Gas & Electric	1,905	78	8	534	22	0	0	0	0	0	0	0	3	0
Kentucky Utilities	3,067	97	-8	0	0	0	59	2	0	24	1	0	0	0
KPL Gas Service	2,249	87	-1	0	0	0	340	13	1	0	0	0	0	0
Long Island Lighting	INFORMATION NOT PROVIDED BY COMPANY													
Louisville Gas & Electric	2,629	96	495	0	0	0	108	4	0	0	0	0	0	0
Madison Gas & Electric	427	67	3	94	15	0	115	18	0	0	0	0	0	0
MDU Resources Group Inc.	361	83	2	0	0	0	74	17	14	0	0	0	0	0
Midwest Resources*	1,868	75	883	0	0	0	625	25	422	0	0	0	0	0
Minnesota Power	1,051	90	-107	0	0	0	0	0	0	116	10	0	0	0
Montana Power*	687	58	-212	0	0	0	0	0	0	489	42	-29	0	0
Nevada Power	1,337	76	25	0	0	0	399	23	0	0	0	0	30	2
New England Electric*	2,599	64	-21	254	6	113	0	0	0	1,168	29	5	56	1
New York State Electric & Gas	2,414	90	0	194	7	1	0	0	0	68	3	2	7	0
Niagara Mohawk Power	3,655	65	1	1,051	19	1	211	4	-19	708	13	28	0	0
Northeast Utilities*	INFORMATION NOT PROVIDED BY COMPANY													
Northern Indiana Public Service	3,145	94	0	0	0	0	206	6	-35	10	0	0	0	0
Northern States Power	3,874	57	-31	1,542	23	2	1,151	17	24	262	4	6	0	0
Ohio Edison	4,799	78	152	1,194	19	7	138	2	25	0	0	0	26	0
Oklahoma Gas & Electric	5,633	99	-12	0	0	0	59	1	0	0	0	0	0	0
Orange & Rockland Utilities	887	88	-16	0	0	0	74	7	0	44	4	0	0	0
Otter Tail Power	539	85	4	0	0	0	87	14	0	4	1	0	1	0
Pacific Gas & Electric	INFORMATION NOT PROVIDED BY COMPANY													
PacifiCorp	6,124	84	14	27	0	0	14	0	-1	1,103	15	0	21	0
Pennsylvania Power & Light	5,785	69	0	1,890	23	0	486	6	0	146	2	0	22	0
Philadelphia Electric	2,769	32	0	3,938	45	1055	756	9	-48	1,290	15	0	13	0
Pinnacle West Capital*	2,291	55	196	1,109	27	0	754	18	0	6	0	0	0	0
Portland General*	646	24	-24	745	28	0	650	24	0	611	23	0	6	0
Potomac Electric Power	4,809	88	0	0	0	0	649	12	84	0	0	0	1	0
Public Service Enterprise Group*	INFORMATION NOT PROVIDED BY COMPANY													
Public Service of Colorado	2,474	82	0	0	0	0	209	7	38	306	10	221	16	1
Public Service of Indiana	5,386	96	10	0	0	0	0	0	0	45	1	-10	196	3
Public Service of New Hampshire	INFORMATION NOT PROVIDED BY COMPANY													
Public Service of New Mexico	1,181	74	0	390	25	0	20	1	0	0	0	0	0	0
Puget Sound Power & Light	858	46	0	0	0	0	700	37	1	310	17	0	3	0
Rochester Gas & Electric	541	44	0	621	50	0	29	2	0	47	4	0	0	0
San Diego Gas & Electric	INFORMATION NOT PROVIDED BY COMPANY													
SCANA Corporation* (SCE&G)	2,286	59	0	590	15	0	259	7	0	756	19	0	0	0
Sierra Pacific Power	742	89	0	0	0	0	37	4	0	7	1	0	50	6
Southern California Edison	8,769	62	0	2,541	18	0	1,614	11	0	1,154	8	1	8	0
Southern Company*	22,613	76	48	3,428	12	11	1,171	4	0	2,592	9	0	0	0
Southern Indiana Gas & Electric	1,028	88	0	0	0	0	135	12	0	0	0	0	0	0
Southwestern Public Service	3,945	97	0	0	0	0	92	2	0	0	0	0	14	0
St. Joseph Light & Power Co.	278	73	2	0	0	0	103	27	23	0	0	0	0	0
TECO Energy*	3,003	94	48	0	0	0	188	6	0	0	0	0	0	0
Texas Utilities*	17,803	89	-1	1,150	6	1150	975	5	390	0	0	0	0	0
TNP Enterprises* (Tex-NM Power)	0	0	-39	0	0	0	0	0	-11	0	0	0	156	100
Tucson Electric Power	1,473	87	360	0	0	0	218	13	0	0	0	0	0	0
Union Electric	5,351	71	44	1,125	15	0	374	5	0	681	9	50	5	0
United Illuminating	1,136	81	15	243	17	201	0	0	0	0	0	0	22	2
Utilicorp United	652	69	0	0	0	0	294	31	0	0	0	0	0	0
Washington Water Power*	453	31	0	0	0	0	68	5	0	946	64	0	0	0
Wisconsin Energy*	3,441	72	NA	990	21	NA	258	5	NA	75	2	NA	0	0
Wisconsin Power & Light	1,454	78	-9	213	11	-5	174	9	-8	21	1	-20	1	0
Wisconsin Public Service	1,277	75	0	219	13	0	153	9	0	54	3	0	4	0

* Holding company

NA - Not Available/Not Applicable

** Simple and combined-cycle

0 (in change columns) - Less than 1% and/or zero in both years

Some prime examples of utilities with large negative system reserve margins are: Interstate Power, at -38 percent; El Paso Electric, at -31 percent; and FPL Group, at -21 percent (Table 7).

Added types of generation

The Top 100 may have reported less generation capacity in all categories because they are buying more power from cogenerators and independent power producers.

On the other hand, companies adding large amounts of conventional steam capacity last year included Midwest Resources, which added 883 MW; Louisville Gas & Electric, 495 MW; and Eastern Utilities Associates, 259 MW (Table 8).

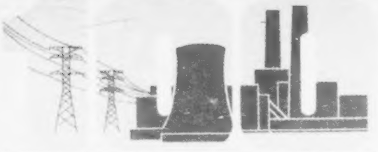
Those that sharply reduced their steam capacity were Montana Power, at 212 MW less and CMS Energy, at minus

TABLE 4.
TOP GENERATING UNITS BY HEAT RATE
(capac. factor >50%)

Rank & Unit	Capacity (MW)	Reporting Utility	Heat Rate (Btu/kWh)
1. Colstrip-1	233	Washington Water Power	8,610
2. Comanche Power -1	260	Central & Southwest	8,901
3. Belews Creek-2	1120	Duke Power	9,017
4. Marshall-3	660	Duke Power	9,112
5. Canal Plant-1	569	Commonwealth Energy	9,211
6. Fort Martin	555	Allegheny Pwr. System	9,211
7. Monroe-3	750	Detroit Edison	9,240
8. Eastlake	411	Centerior Energy	9,242
9. Conemaugh-2	33	Delmarva Pwr. & Light	9,251
10. Morgantown-2	582	Potomac Electric Pwr. Co.	9,254
11. Montour-2	750	Pennsylvania Pwr. & Light	9,273
12. Bayshore	215	Centerior Energy	9,296
13. J.H. Campbell-3	719	CMS Energy	9,307
14. Crystal River-4	717	Florida Progress	9,307
15. Marshall-2	385	Duke Power	9,308
16. Marshall-1	385	Duke Power	9,321
17. J.M. Stuart-2	228	Cincinnati Gas & Electric	9,326
18. Crystal River-5	717	Florida Progress	9,352
19. Monroe-1	750	Detroit Edison	9,358
20. Montour-1	765	Pennsylvania Pwr. & Light	9,361

TABLE 5.
TOP SYSTEM HEAT RATES, CONVENTIONAL FOSSIL-FUELED BOILERS

Utility	Heat Rate (Btu/kWh)
1. Duke Power	9,468
2. CMS Energy	9,701
3. Cincinnati Gas & Electric	9,794
4. United Illuminating	9,866
5. Dominion Resources	9,870
6. Dayton Power & Light	9,880
7. New York State Electric & Gas	9,883
8. Florida Progress	9,936
9. Allegheny Power System	9,944
10. Potomac Electric Power	9,961



148 MW.

In terms of nuclear, Detroit Edison says it added 104 MW of this type of capacity to its portfolio; New England Electric added 113 MW with its Seabrook share; Philadelphia Electric started the Limerick-2 unit for an additional 1055 MW; and Texas Utilities started up 1150 MW of nuclear power capacity with Comanche Peak-1.

In spite of all the industry interest in large combustion turbines, they did not seem to be of great interest to the Top 100. Reported totals actually showed close to a 1-percent net decline in combustion turbine capacity in 1990.

General Public Utilities, however, added 1162 MW in this category in 1990; Dominion Resources added 535 MW; Texas Utilities, 390 MW; and Wisconsin Energy, 258 MW.

Transmission & distribution

As usual, the overall picture is one of adding transmission and distribution lines. Most utilities reducing mileage in one category only added it somewhere else.

In toto, though, the Top 100 electric utilities added 2,855 miles of transmission lines, 18,810 miles of overhead distribution lines and 27,355 miles of underground distribution lines.

Texas utilities alone increased its transmission lines by 12,761 circuit miles: 8,956 miles of below-189 kV and 3,805 above 189 kV. Montana Power reported that it added 5,627 miles of below-189-kV transmission and 1,445 miles of above 189 kV, and Niagara Mohawk Power installed 8,132 circuit miles and 1,127 circuit miles, respectively. But the high-water mark was hit by Southern Company, which added 19,944 miles below 189 kV and 6,420 miles of line above that voltage, for total transmission lines added of 26,364 circuit miles.

Note that in distribution lines, the utilities reporting to *EL&P* were still putting in more underground than overhead distribution lines by about a two-to-one margin. As in previous years, the large majority of additions was rated 22 kV and below.

Despite the transmission additions reported, NERC said that portions of the bulk electric transmission systems could be loaded to their reliability limits much of the time during the summer months by intersystem transfers. And increased use of operating procedures to get around equipment limitations complicates the work of system operators and decreases their degree of flexibility to meet day-to-day operations problems.

One potential transfer problem listed by NERC was that portions of the eastern transmission system in ECAR would continue to be loaded heavily much of the time during the summer. A set of procedures would have to be followed to limit transfers to ensure system reliability. Another potential problem was Central Power & Light Co., which would have to monitor its transfer capability closely until a planned 345-kV line was approved and built.

	Transmission				Distribution							
					Overhead				Underground			
	Below 189 kV (circuit miles)	Miles Added	189 kV & Up (circuit miles)	Miles Added	Below 22 kV (pole miles)	Miles Added	22 kV & Up (pole miles)	Miles Added	Below 22 kV (cable miles)	Miles Added	22 kV & Up (cable miles)	Miles Added
Allegheny Power System*	3,541	85	1,109	2	48,931	-1202	4,646	36	4,232	399	30	8
American Electric Power*	15,803	8	5,926	0	93,276	371	6,236	339	8,308	1028	597	120
Atlantic Energy*	1,219	25	97	33	9,021	54	0	0	923	19	0	0
Baltimore Gas & Electric	649	-9	505	10	NA	NA	732	0	NA	NA	350	0
Bangor Hydro-Electric Company	580	NA	0	NA	3,091	NA	0	NA	0	NA	0	NA
Boston Edison	200	0	162	0	4,653	42	0	0	7,805	282	0	0
Carolina Power & Light	3,103	-8	3,065	14	NA	NA	38,415	253	NA	NA	5,679	497
Centel*	NA	NA	2,963[1]	NA	NA	NA	6,732	48	NA	NA	731	13
Centerior Energy*	0	0	0	0	16,573	42	0	0	6,873	67	20	0
Central Hudson Gas & Electric	526	0	76	0	6,467	29	46	0	1,017	86	0	0
Central Illinois Public Service	4,255	-12	305	0	8,324	17	0	0	747	26	0	0
Central Louisiana Electric	801	0	363	0	0	0	10,924	129	0	0	303	27
Central Maine Power	2,023	-1	208	0	17,518	269	325	1	946	71	12	0
Central Vermont Public Service	624	1	0	0	7,349	44	0	0	184	15	0	0
Central & South West*	13,995	-33	1,813	-152	56,526	518	582	9	6,472	-40	362	1
Cilcorp*	284	0	47	0	5,597	-3	614	-1	1,796	29	7	0
Cincinnati Gas & Electric	1,330	7	383	0	9,066	24	552	9	2,394	111	36	3
CMS Energy*	7,943	0	1,918	0	49,091	416	0	0	7,526	656	0	0
Commonwealth Edison	2,467	21	2,552	0	0	NA	36,308	217	0	NA	26,267	1482
Commonwealth Energy System*	300	0	61	0	3,698	-32	2,086	24	2,735	103	1,077	57
Consolidated Edison	22	0	409	0	25,422	22	516	11	58,801	223	6,982	164
Delmarva Power & Light	1,136	10	263	0	1,815	-1	4,832	63	1,071	69	2,661	200
Detroit Edison	4,447	11	1,031	1	30,496	205	0	0	8,803	453	0	0
Dominion Resources*	2,774	-23	3,146	49	NA	NA	37,545	331	NA	NA	17,047	595
DPL*	1,347	2	448	0	NA	NA	NA	NA	NA	NA	NA	NA
DQE*	INFORMATION NOT PROVIDED BY COMPANY											
Duke Power	9,396	16	3,153	53	49,164	-131	9,557	-1	5,795	528	2,903	264
Eastern Utilities Associates*	185	2	178	0	893	3	3,277	-8	279	14	832	3
El Paso Electric	704	-7	1,109	269	3,218	48	1,526	21	864	23	143	7
Empire District Electric	1,261	4	22	0	4,986	77	0	0	263	13	0	0
Entergy Corp.*	7,208	1	3,065	19	67,696	511	4,789	40	3,950	226	1,683	6
Florida Progress* (FPC)	2,753	39	1,561	4	NA	NA	NA	NA	4,816	343	0	0
FPL Group* (FP&L)	2,245	-11	3,304	11	NA	NA	37,238	706	NA	NA	15,540	1037
General Public Utilities*	4,484	42	2,216	12	42,493	-133	5,896	529	15,753	754	1,611	146
Green Mountain Power	281	0	0	0	2,267	9	21	1	325	15	9	2
Gulf States Utilities	3,142[1]	-2[1]	1,034[1]	0	18,377	113	1,415	8	1,708	-65	117	2
Hawaiian Electric*	1,473	3	0	0	4,067	49	0	0	2,191	-287	0	0
Houston Industries*	2,541	37	1,030	-2	18,235	81	1,500	43	4,726	299	1,341	97
Idaho Power	3,187[1]	-54[1]	1,481[1]	0	12,922	-75	4,256	51	5,065	183	262	30
IE Industries*	3,193	0	67	0	4,723	5	0	0	2,081	123	0	0
Illinois Power	2,324	2	484	0	16,744	-30	1,327	-4	1,256	46	4	0
Interstate Power	2,522	4	74	0	0	0	NA	NA	614	25	0	0
Iowa Southern*	932	0	61	0	3,150	-4	0	0	NA	NA	492	14
Iowa-Illinois Gas & Electric	632	0	305	0	4,686	12	0	0	1,289	1289	0	0
IPALCO Enterprises*	602	-2	454	0	4,696	9	0	0	5,078	223	0	0
Kansas City Power & Light	1,376	-3	295	0	8,903	22	0	0	6,115	186	0	0
Kansas Gas & Electric	1,599	3	663	0	7,768	2	0	0	2,340	99	0	0
Kentucky Utilities	4,277	9	412	0	14,701	122	0	0	977	34	0	0
KPL Gas Service	3,612	2	791	0	12,592	-24	0	0	1,408	103	0	0
Long Island Lighting	INFORMATION NOT PROVIDED BY COMPANY											
Louisville Gas & Electric	760	0	133	2	3,335	14	106	0	2,358	231	0	0
Madison Gas & Electric	194	16	124	0	1,075	0	0	0	869	44	0	0
MDU Resources Group Inc.	2,831	0	319	0	2,832	8	0	0	1,751	-15	0	0
Midwest Resources*	3,246	1100	530	346	11,550	11550	0	0	2,726	NA	NA	NA
Minnesota Power	1,543[1]	2[1]	607[1]	0	3,861	70	647	11	1,026	28	4	0
Montana Power*	5,627	63	1,445	0	13,033	36	0	0	0	0	0	0
Nevada Power	686	118	757	119	2,958	15	0	0	4,271	395	0	0
New England Electric*	1,994	1	684	0	16,975	157	754	-9	7,690	209	332	112
New York State Electric & Gas	3,786	-3	813	0	31,108	228	1,921	-13	0	0	0	0
Niagara Mohawk Power	8,132	67	1,127	1	0	NA	109,266	317	0	NA	8,140	244
Northeast Utilities*	INFORMATION NOT PROVIDED BY COMPANY											
Northern Indiana Public Service	2,665	6	354	22	7,650	14	0	0	939	63	0	0
Northern States Power	5,464	56	1,467	7	28,130	66	0	0	12,501	457	0	0
Ohio Edison	4,898	5	628	-0	24,968	76	0	0	3,925	284	0	0
Oklahoma Gas & Electric	3,622	6	982	0	0	0	20,618	44	0	0	5,895	93
Orange & Rockland Utilities	471	0	80	0	4,796	40	0	0	1,253	90	0	0
Otter Tail Power	4,863	0	411	0	0	0	0	0	0	0	0	0
Pacific Gas & Electric	INFORMATION NOT PROVIDED BY COMPANY											
PacifiCorp	9,553	4	5,828	263	0	NA	44,215	62	NA	NA	NA	NA
Pennsylvania Power & Light	0	0	1,308	0	49,852	428	2,423	26	[illegible]569	726	14	0
Philadelphia Electric	179	0	774	7	12,264	40	61	0	18,151	813	17	0
Pinnacle West Capital*	2,378[1]	19[1]	2,419[1]	0	10,809	78	0	0	7,462	233	0	0
Portland General*	945[2]	12[2]	1,038[2]	-0	8,775	6	0	0	5,754[2]	435[2]	0	0
Potomac Electric Power	26	0	788	5	4,505	-6	356	28	11,210	92	793	1
Public Service Enterprise Group*	INFORMATION NOT PROVIDED BY COMPANY											
Public Service of Colorado	1,609	22	1,405	31	11,504	15	1,527	6	5,769	120	277	30
Public Service of Indiana	4,015	10	1,392	0	18,262	12	0	0	3,016	144	0	0
Public Service of New Hampshire	INFORMATION NOT PROVIDED BY COMPANY											
Public Service of New Mexico	892	4	1,896	0	4,772	38	0	0	2,451	58	0	0
Puget Sound Power & Light	1,847[1]	-2[1]	401[1]	0	10,101	-84	137	0	5,240	273	26	2
Rochester Gas & Electric	706	1	0	0	6,759	40	0	0	4,301	149	0	0
San Diego Gas & Electric	INFORMATION NOT PROVIDED BY COMPANY											
SCANA Corporation* (SCE&G)	2,413	1	789	1	6,463	141	7,919	166	109	-3	97	4
Sierra Pacific Power	2,709	4	914	0	6,873	63	1,350	32	431	-237	2,649	158
Southern California Edison	6,556	-39	5,047	-279	NA	NA	44,951	135	56,487	6126	196	6
Southern Company*	19,944	-9	6,420	80	NA	NA	94,865	1111	NA	NA	21,499	1847
Southern Indiana Gas & Electric	864	5	0	0	3,176	0	0	0	873	38	0	0
Southwestern Public Service	4,027	5	1,515	0	NA	NA	NA	NA	NA	NA	NA	NA
St. Joseph Light & Power Co.	416	0	117	0	2,195	17	0	0	149	9	0	0
TECO Energy*	813	12	354	-3	6,709	22	0	0	2,132	64	0	0
Texas Utilities*	8,956	20	3,805	-31	48,208	-40	5,080	382	8,581	479	2,380	155
TNP Enterprises* (Tex-NM Power)	1,248[1]	0	253[1]	177[1]	9,008	53	0	0	488	5	0	0
Tucson Electric Power	264	-61	1,633	129	7,651	290	475	-11	3,487	173	0	0
Union Electric	2,202	0	988	0	20,790	179	3,955	-52	9,706	364	359	0
United Illuminating	91	0	6	0	3,077	0	0	0	1,126	30	3	1
Utilicorp United	1,273[1]	26[1]	58[1]	0	6,727	90	108	4	849	94	16	16
Washington Water Power*	1,509[1]	1[1]	657[1]	0	8,709	23	591	3	1,486	56	0	0
Wisconsin Energy*	1,937	NA	685	NA	0	NA	22,608	NA	0	NA	10,880	NA
Wisconsin Power & Light	2,686	3	107	0	16,911	39	0	0	1,433	86	0	0
Wisconsin Public Service	1,504	12	124	0	NA	NA	18,048	-1484	NA	NA	1,957	28

* Holding company

NA -Not Available/Not Applicable

[1] Pole Miles

[2] Conduit Bank Miles

Utilities manage fleet systems efficiently, says survey

NEW YORK—Most utilities have transportation departments, maintain information systems to manage their fleets more efficiently and do a majority of maintenance in-house, according to Stone & Webster's Fifth Utility Fleet Management Survey.

Some 118 electric, gas, and combination utilities throughout the U.S., Canada, and the Caribbean responded to the 1990 survey.

To provide a basis for comparing data among utilities with different fleet size and mixed characteristics, Stone & Webster used a "maintenance and repair unit (MRU)" as a common equivalent element in quantifying maintenance work load, analyzing staffing and facility requirements and evaluating fleet performance data.

One MRU is equivalent to 20 mechanic-hours per year. The number of MRUs is the total number of vehicles in a particular class multiplied by a maintenance and repair factor (MRF).

Fig. 1 shows the MRF for different classes of vehicles or equipment.

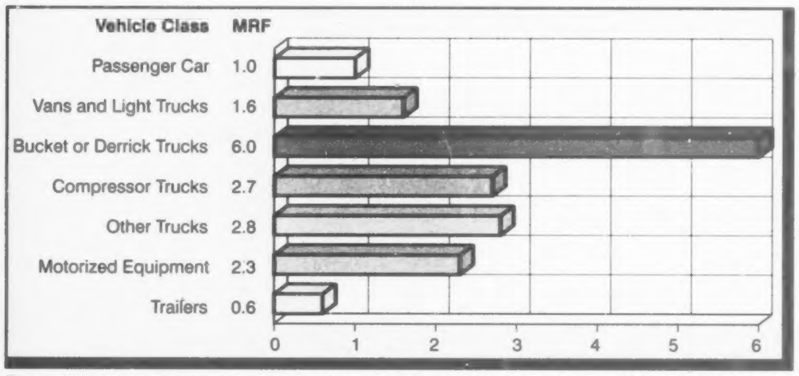


Figure 1. Maintenance requirements vary by vehicle class and are compared with a maintenance and repair factor (MRF) derived from the survey.

The average amount of maintenance work done in-house was 84 percent (see Table below). The type of work most frequently contracted out was for body and paint work, driveline repairs, alignments, glass work, tire repairs and engine work.

Fleet Maintenance and Operations Utility Survey Responses	%
Have transportation department	93
Use work standards	34
Have computerized fleet system	80
Developed system in-house	72
Automated fuel dispensing system	40
Rebuild aerial units in-house	35
Rebuild truck bodies in-house	31
Provide maint. on non-co. units	8
Avg. amt. of work done in-house	84

Passenger cars, vans, and light trucks comprise about 50 percent of a utility's fleet (Fig. 2). Vehicle utilization, replacement and age varies by vehicle class.

Passenger cars are driven about 12,600 miles per year and are replaced generally after 5 years or 80,000 miles. The average age of this class for those responding was 3 years.

Vans and light trucks are driven about the same. The guidelines for replacement is 6 years or 90,000 miles. The average age for this class was 4 years.

Bucket trucks are driven 10,000 miles annually or 1,200 hours with replacement guidelines at 10 years or 100,000 miles. The average age of the fleet for this class was 5 years.

Derrick trucks are driven 6300 miles or 900 hours. Replacement guidelines for this class was also 10 years or 100,000 miles. The age for this class was 6 years.

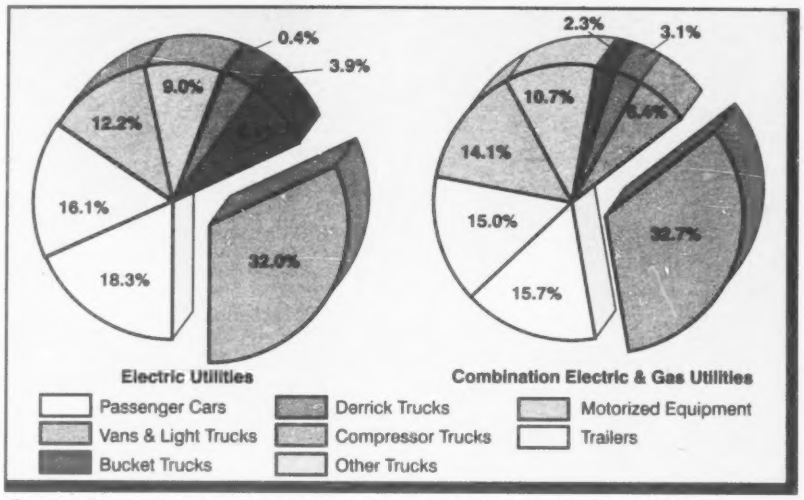


Figure 2. Passenger cars, van, and light trucks comprise about one-half of a utility's fleet.

Alternate fuels

Of those fleets with both natural gas or other alternative fuels and gasoline units, about 3.9 percent use natural gas. Of the 5142 vehicles using fuels other than gasoline, 77 percent used natural gas (Fig. 3). The rest used propane, methanol or electricity.

Natural gas and other alternative fuels for vehicles will become increasingly important in the future, according to the survey results. Some 47 percent of the utilities either have or plan to have natural gas vehicles (NGV). The NGV fleet is already at 3.9 percent. Maintenance on the NGV fleet is about the same as for other fuels, according to 45 percent of those responding. Some 31 percent said they cost more to maintain and 24 percent said they cost less.

The forecasted growth rate in NGV was 18 percent per year. Some 39 percent said they either have or plan to have other alternate fuel vehicles.

Maintenance

For every two mechanics and working foremen, there is one other employee involved in a transportation support, supervisory or management role (Fig. 4). About one-fourth of the utilities said their mechanics work only one shift (Fig. 5, see p. 26). Some 62 percent work two shifts and 12 percent work three shifts.

Personnel and facility resources are directly related to the maintenance workloads:

- In-house MRUs per transportation employee: 33.1.
- In-house MRUs per maintenance work bay: 61.3.
- Average number of work bays per mechanic: 1.25.

The location of maintenance facilities is usually determined by population density. The radius in miles by location is:

- Center city: 16 miles.
- Suburban: 25 miles.
- Rural: 50 miles.

Continued on page 26

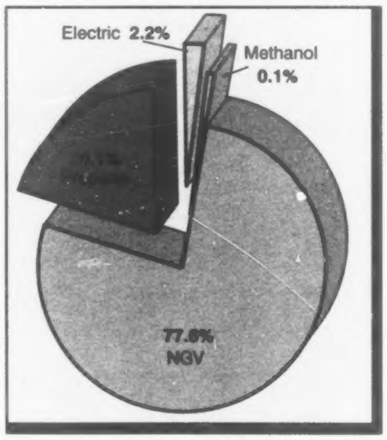


Figure 3. Natural gas and other alternate fuel vehicles will become increasingly important in the future. About four percent of the 5142 vehicles now use NG.

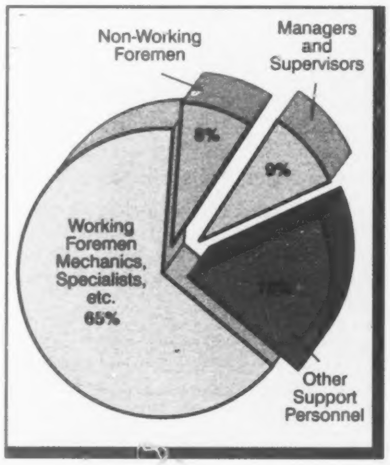


Figure 4. For every two mechanics and working foremen, there is one other employee involved in a transportion support, supervisory or management role.

Should computers speak the same language?

COLUMBUS, OH—The modern utility relies on data from dozens of computers to operate efficiently, but many of these machines don't speak the same language.

Research is underway, however, to develop standards and protocols for integrating these data systems across the spectrum of utility operations.

At the recent annual meeting of the Utilities Telecommunications Counsel (UTC), Robert A. Prichard Jr., telecommunications network planning manager at Public Service of Colorado, presented reasons why utilities should adopt the Utilities Communication Architecture (UCA).

The UCA background

UCA is the result of earlier research by the Electric Power Research Institute (EPRI) in developing specific communications protocol based on the Open Systems Interconnection (OSI) reference model. It was designed to meet utility industry requirements and provide an evolutionary path for the development of interoperable communications systems within the industry.

UCA version 1.0 was introduced in August 1990, and the response was favorable but somewhat cautious, according to Prichard. EPRI and its sponsors are convinced that a standards-based approach is the best way to develop interoperable systems.

Two issues involved

Prichard says there is a level of stability in a utility's communication structure and there must be compelling business reasons to consider significant change and endure its associated discomfort.

He points out that the commitment to a change to UCA has been a measured one simply because there is not a direct answer to the question, "What is the impact of a decision to implement the UCA?"

The decision to commit to UCA can be reduced to two fundamental issues:

- Why should a utility adopt the UCA?
- How can the UCA be used to select telecommunications products?

The why of UCA

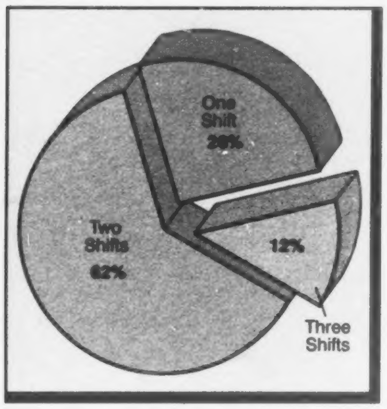
Prichard says the "why" is a management decision based on controlling financial and technical risk. These two factors are the driving force behind two basic reasons why individual utility companies should adopt the UCA:

- The UCA provides a standard set of applications and communications protocols that address the specific needs of the utility industry. Employing this standard enables a utility to control the effects of the increasing rate of change in telecommunications technology. It provides better control over changes in products in the market place.
- The set of applications and communications services identified by the UCA can be used to develop a business-based transition plan that provides for maximum use of existing system assets and reduces the risk in acquiring future assets.

Continued on page 27

from page 22

Fleet systems...



Some 80 percent of those responding had computerized fleet information systems and most were developed in-house (Fig. 6). Mainframe computers are used by those utilities with 2000 or more fleet vehicles. For those with fewer than 500 vehicles, PCs are used by 63 percent of the utilities. For those in the 1000 to 1999 fleet size, minicomputers are used by 14 percent.

Fleet cost and performance

A number of economic and other ratios can be examined to review a utility's fleet performance. The average economic ratios include:

- Maintenance cost (1989): $1350/MRU: 35¢/mile.
- Fuel and lubrication (1989): $430/MRU: 10¢/mile.
- Replacement budget (1989): $1230/MRU.
- Replacement budget (1990): $1240/MRU.

Performance ratios include:

- Average vehicle miles/gallon: 10.2.
- Average miles traveled per vehicle per year: 11,130.
- Proportion of work that is scheduled: 45 percent.
- Overall fleet downtime rate: 3 percent.
- Parts turnover per year: 3.3.

The per fleet size per month data includes:

- Repair orders completed: 0.79/MRU.
- Downtime hours: 0.94/MRU.
- Road calls: 0.4/MRU.

◆ Figure 5. Two-shift operations predominate among fleet owners.

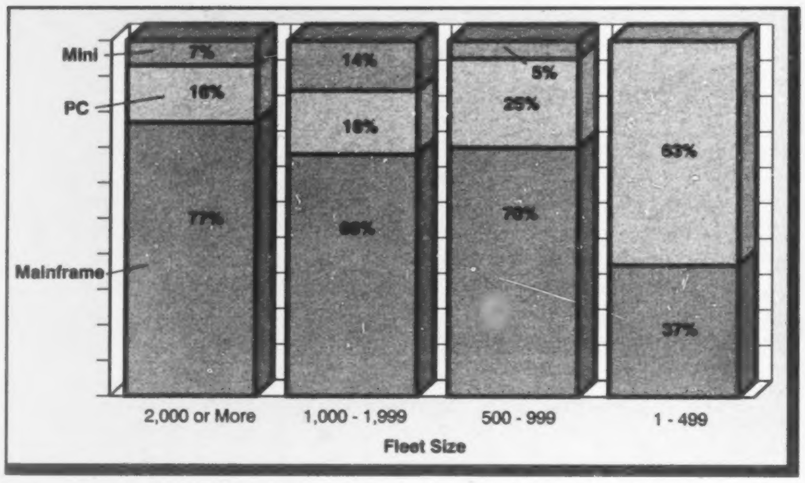


Figure 6. Mainframe computers predominate, except in fleets with fewer than 500 vehicles.

More information

For more information on this survey contact: Sal Bibona, Stone & Webster Management Consultants Inc., One Penn Plaza, New York, NY 10019; Ph. 212/290-7115; fax 212/290-7033.

Meter program saves $42k annually

CINCINNATI—Cincinnati Gas & Electric Co.'s electric meter department is saving 300 miles of paper and several thousand phone calls annually with its new computerized Electric Meter Check-In Tag System.

When an electric meter is removed for routine maintenance, repair or replacement, the check-in tag shows the final reading and other information used by several other departments.

Under the old system, this information was transcribed into a file and printed as a book containing 900-1000 pages. Six copies were distributed to customer accounting, service records, special ledger, electric service and electric-meter departments. All other departments that needed meter information would call the electric meter department 20-30 times a day.

Each day, the previous edition—consisting of two boxes of computer paper—was discarded. That comes to 520 boxes a year, each box containing 3000 ft of paper.

The utility reports total savings of $42,000 a year. The online Electric Meter Check-In Tag Report is immediately available to anyone with access to a CICS terminal. The system reduced the use of printers, saves paper, and nearly ended telephone interruptions.

"We are already seeing 250 inquiries a day into the system," said Oscar Rummel, electric planning department. "It eliminated people waiting in line to use the listing or getting up to go see where it's stored and not finding it."

The online system uses a Database II program and has Common User Access protocol as well, Rummel added. A team of in-house personnel developed it.

Ericsson GE Gives You The Best In Radio Communications. But Don't Take Our Word For It...

"From the beginning of our planning for the new system, we made every effort to ensure that it will meet end-user requirements, both today and well into the future. We expect our wide-area system to promote greater efficiency in our daily operations. With improved communications, we will be able to respond faster in emergencies and offer our customers better overall service."

George Schindler
Supervising Engineer for Communications & Special Projects
Union Electric Co.
St. Louis, Missouri

"GE has just completed installation of our eight-site, 10-channel, trunked simulcast radio system here in San Diego County. We've been very impressed with the quality of the installation; the equipment; the system design and engineering; and the overall performance of the 16^{PLUS} system. GE has demonstrated to us their position as the technical leader in the field of trunked two-way radio communications."

Russ Collins
Manager of Telecommunications
San Diego Gas & Electric Co.
San Diego, California

"GE was responsive in listening to our needs, and used their resources to design accordingly. We needed a system to replace our low-band system, and we needed to improve coverage in our 40 x 80 mile service area. GE's four-site conventional 800 MHz system did the job with margin to spare. The coverage was much improved."

John Newland
System Engineer
Henderson Union Rural Electric Cooperative Corporation
Henderson, Kentucky

Why are utilities across the country choosing Ericsson GE radio systems? Ask the experts—your peers in the field. They'll tell you we're committed to meeting the rigorous demands of the utility environment. Our detailed Radio Communications Equipment Guide will show you the quality products and systems that are helping us keep that commitment. Call **1-800-GE-12345** for your free copy.

Radio Communications Equipment Guide For Utilities

Mobile Communications

Ericsson GE Mobile Communications Inc.

Inquire R.S. 15

Seal replacement eliminates combined-cycle plant downtime

CHICAGO—Frequent seal failures plagued boiler feedwater pumps at Puerto Rico's Aguirre Power Station on the island's southeast coast near the city of Salinas. Detailed seal analysis, redesign and retrofitting solved the problem, though.

Largest plant on island

Since it has the largest capacity of any Puerto Rico Electric Power Authority (PREPA) plant, at 600 MW, operational reliability is particularly important at Aguirre. However, Victor J. Yunque, preventive maintenance engineer, notes that achieving maximum efficiency in the combined-cycle operation was hindered by repeated mechanical seal failures in the eight primary and eight standby boiler circulator pumps. They supplied the two 100-MW steam turbines downstream of the eight 50-MW gas-fired turbines.

Yunque complains, "Every time both pumps of a steam generator went down, we would lose about 20 to 25 megawatts of generating capacity." And he adds, "To this, you have to add the cost of a two-man maintenance crew for the three days it normally took to get a pump back online."

Primary cause of seal failure was warping of the elastomer O-rings. Yunque feels the O-rings could not withstand the temperature buildup of up to 540°F inside seal chambers. O-rings with different elastomeric compositions were tried, but the failures still continued.

Says Yunque, "They also changed the size of the O-rings, but that didn't work."

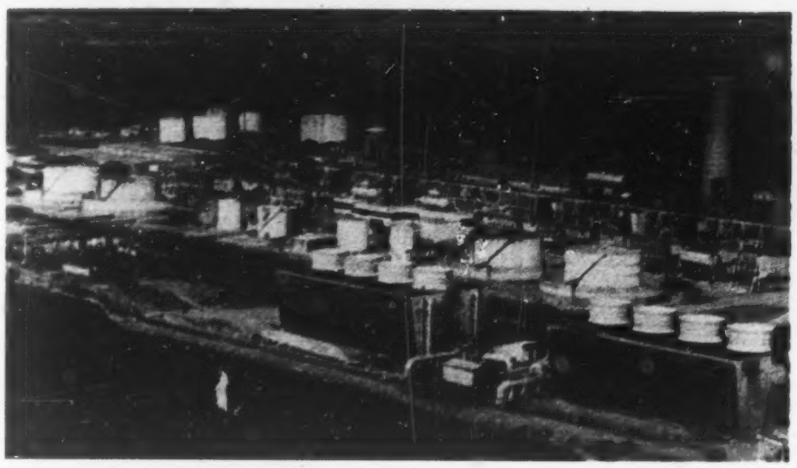
Results

First, three pumps were retrofitted with a John Crane Type 8B1 O-ring seal that can withstand temperatures of −40°F to +500°F. This stopped primary pump leakage, but not leaks from standby pumps.

Another retrofit, with a larger-diameter seal chamber slowed the failure rate in the standbys. Crane engineers decided that water hammer was adding to the damage from the heat buildup. So they modified the final version of the seal with a washer of hard-wearing, tungsten-carbide.

Eight of the plant's pumps were retrofitted with the Type 8B1-HH seals, and technicians are installing the new seals in the remaining pumps.

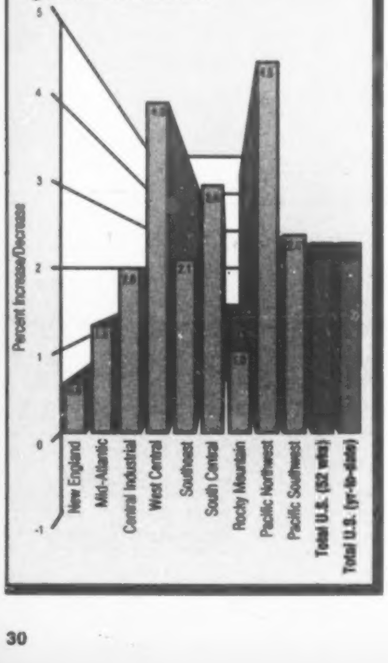
The retrofitted seals halted loss of up to 25 MW of generating capacity per day caused when pumps went down and also shortened each seal's installation by 4 hr. In addition, the new elastomeric O-ring seals from John Crane Inc. lengthened seal life, which had sometimes been as short as one day since the pumps were installed in 1974—the retrofitted version has performed without failure since installation in April 1988.



The Aguirre combined-cycle plant is the Puerto Rico Power Authority's largest generating facility.

ELECTRIC OUTPUT
Still Growing

Net electric output from the Mainland U.S. electric utility industry increased for the 52 weeks ending June 29, as reported by Edison Electric Institute. All geographical EEI regions shared in this rise.



CFB proves itself in San Francisco

SAN FRANCISCO—Five circulating fluidized-bed boilers operating in the San Francisco area since 1989 and 1990 have met or exceeded contracted specs, proving out the basic concept of CFB boilers for the utility industry.

Ten of this model fluidized-bed boiler units now operate in the U.S. Each of the 10 burns solid fossil fuel, yet meets or exceeds California's strict emission standards.

The five bay-area units are the first ones in the U.S. to fire 100-percent "fluid petroleum coke", a solid-fuel byproduct of oil refinery production, according to Combustion Power Co., which makes the boilers. They burn the fuel, formerly a waste product, with 99-percent efficiency and reductions of SO_2 and NOx emissions greater than 95 percent. Other fuels the boilers can burn include petroleum coke, coal fines, high-sulfur coal, and wood waste.

Specified combustion efficiency was 98 percent; typical efficiencies have been 98-99 percent. Guaranteed SO_2 removal was 97.5 percent (or, 54 ppm at 3-percent O_2); actual has been 98-99 percent (10-45 ppm SO_2). NOx emissions were specified for 50 ppm at 3-percent O_2); they've actually been 10-35 ppm. Lastly, CO emissions were to be 120 ppm; actual emissions have been 20-100 ppm.

Typical monthly capacity factors have ranged from 75 to 102 percent.

Owned by GWF Power Systems Inc., the last of the five 20-MW units went online late in 1990, making the five of them capable of supplying a total of 100 MW to the Pacific Gas & Electric Co. electric grid.

Inside the combustion chamber of the fifth San Francisco bay-area power plant, two technicians prepare to fire the FI CIRC boiler, which will eventually reach a temperature of 1625°F.

Solid-oxide fuel cells to be made here, and tested here and abroad

BARRINGTON, IL—The solid-oxide fuel cell may be on the way to commercial reality now that the Dept. of Energy and Westinghouse Electric Corp. have begun a combined effort to speed up the cell's development.

The $140-million, five-year cooperative agreement is split, with the government funding $64 million, and Westinghouse and other sponsors providing $76 million. The DOE Morgantown Energy Technology Center will oversee the agreement.

Bigger and better

Westinghouse will test progressively larger single cells and cell bundles, to culminate in tests of two 25-KW modules, three to five 100-kW modules and a 2-MW module. The 2-MW module will be constructed of up to 10,000 individual solid-oxide cells.

The company already has fabricated 3-kW and 20-kW modules to verify that multiple cells can operate together.

"Our joint multimillion-dollar commitment with DOE is a formal acknowledgement of the increasingly favorable outlook for this technology," said Dr. Isaac R. Barpal, Westinghouse vice president, science and technology.

How they work

Solid-oxide cells generate power electrochemically, like batteries—but, more like engines than batteries, operational fuel cells can produce continuous electricity as long as fuel is provided.

In one of the Westinghouse cells, zirconia ceramics produce electricity and heat from a reaction between hydrogen-rich fuel and oxygen from the air. The cell has a tubular configuration of multiple ceramic layers bonded together. The layers contain an air electrode, a solid electrolyte and a fuel electrode. The ceramic compositon allows a cell to operate at higher temperatures (1800°F/1000°C) than other fuel cells.

The high operating temperatures provide hot exhausts needed for energy-efficient applications such as cogeneration, combined-cycle generation in electric utility plants, and useful heat for industrial processes or commercial buildings.

The cells' modular design also should allow them to be economical over a range of power ratings—to meet the needs of utility plants, cogeneration plants, and small industrial and commercial installations. Their tubular construction should lend itself to eventual factory production of modular packages.

Research, field tests

The research program at the Westinghouse Science & Technology Center in Churchill, PA, near Pittsburgh, is to focus on materials development, and cost and performance improvements. A major design goal is to develop tubes of up to 200 cm (nearly 80 in.) in length to double the current length and power output.

Then various sizes of development generators produced at the company's Monroeville, PA, plant will be operated at several utility and industrial sites in this country. In addition, two 25-kW units will be manufactured and shipped to Japan for tests at utilities

Continued on page 32

Zebra mussels now really in Hudson River

NEW YORK—It's really official now—Zebra mussels have made it into the Hudson River. Charles O'Neill of the New York Zebra Mussel Information Clearinghouse in Brockport, NY, confirmed that the mullosks found in May near Rogers Island about 20 miles north of New York City are indeed the problem-causing foreigners that apparently hitched a ride into U.S. waters aboard a foreign freighter.

O'Neill made sure several scientists carefully checked the mussels found in the waters by the island before making his announcement. A similar alarm sounded in November 1990 proved to be false (*EL&P*, 1/91, p.40).

C6985-6A

ELECTRIC LIGHT & POWER

EL&P

SEPTEMBER 1991
Volume 69, Number 9
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

HURRICANE

Cleanup will continue for months after Hurricane Bob caused an estimated 2.1-million power outages, from the Carolinas to Maine, Aug. 18-20. With 138-mph gusts, damage centered on east Long Island and New England. Advanced preparations reduced deaths, injuries and damages. (See p.4, and *EL&P*, 10/91.) **Texas Utilities** plans a $1-billion, third-quarter charge against earnings after regulators disallowed some Comanche Peak plant costs. **Nine Mile Point 2** lost power to several control room systems and shut down Aug. 13 after a power surge from a transformer malfunction. (See *EL&P*, 10/91).

Special section on the IEEE/PES T&D Conference and Exposition starts on page 46

NU seeks T-access changes

FERC sets conditions for PSNH acquisition

HARTFORD, CT—Northeast Utilities said it plans to ask federal regulators to change transmission-access conditions for acquisition of Public Service Co. of New Hampshire.

NU won't go so far as to say the $2.3-billion deal to acquire Public Service Co. of New Hampshire hinges on changes to the Federal Energy Regulatory Commission conditions. But state regulators said their final approval might rely on FERC changes to the conditions.

FERC said NU could not give higher priority to its own non-firm use, including "economy trades," than to third-party requests for firm wheeling in allocating existing transmission capacity.

PSNH emerged from bankruptcy with the understanding NU would acquire it (*EL&P*, 7/91 p.1).

NU and state regulators in New Hampshire said the conditions, as worded, could hurt the state's ratepayers. NU said the FERC decision wouldn't allow NU to bump others with firm contracts off the merged transmission system, should NU find more economical short-term power and need wheeling capacity to buy it. State regulators in Connecticut have scheduled hearings; New Hampshire regulators said they would reject the deal if conditions are unfair to ratepayers.

"The conditions single us out for different treatment apart from the rest of New England," noted NU's Jeffrey R. Kotkin. In addition, FERC said if new capacity couldn't be built to meet addition needs, NU would have to go to FERC and be told how to divide existing capacity, according to Kotkin.

Kotkin said such conditions probably wouldn't occur for 10-15 years.

New Hampshire Public Service Commission agreed with most of what FERC said, but had a "major concern" with the apparent loss of native-load priority for New Hampshire and Connecticut, said a NHPUC spokesperson.

"It seems FERC has relegated us to second-class jurisdiction where we don't have the same rights and benefits of the rest of region," said Wynn Arnold, executive director for NHPUC. "We feel our case is compelling," Arnold added.

NU has 60 days from Aug. 9 to accept or reject FERC's merger conditions, and 30 days from Aug. 9 to file for rehearing, said a FERC spokesperson.

NU had proposed broader transmission access than now exists, including

Continued on page 13

EL&P to launch new publication for power delivery marketplace

BARRINGTON, IL—*Power Delivery Product News*, a sister publication to *Electric Light & Power*, will premier in January. To be published quarterly, the new PennWell Publishing Co. product tabloid magazine is designed to meet the needs of the total power delivery market for information about equipment, apparatus and services.

The new publication will serve a reader audience of 70,000, drawn from the electric utility industry, architect/engineers and system constructors, plus distributors, wholesalers and electrical contractors who work with and for electric utility organizations.

"The growing need for more and better product information is indicated by the steadily increasing number of reader service inquiries we receive each month," says Arthur L. Rice, *EL&P* publisher, who also will be publisher of *PDPN*.

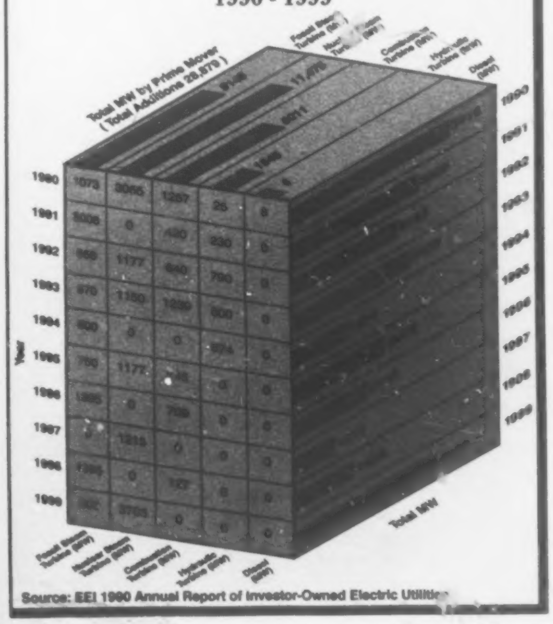
"Since the largest portion of these inquiries come from readers in the power delivery business, we believe *PDPN* provides a unique opportunity to tailor our publication to meet these readers' special interests," Rice added.

Editorial direction for *PDPN* will be provided by *EL&P* Editor-in-Chief Robert Lincicome.

Lincicome pointed out that *PDPN* is a

Continued on page 1

CAPACITY ADDITIONS
(MW by Prime Mover)
1990 - 1999



Source: EEI 1990 Annual Report of Investor-Owned Electric Utilities

DSM grows into $1.5-B/year business this year

Mark T. Hoske
News Editor

BOSTON—Traditional utility thinkers say demand-side management intuitively doesn't make sense. Why would anyone seek to reduce sales?

Answers from utilities, depending on who you ask, range from "it's good business," to "regulators require it."

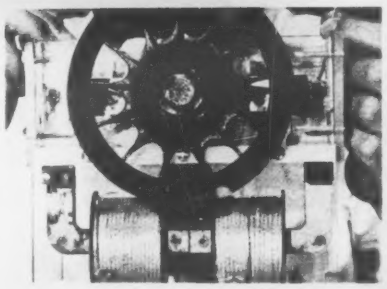
The spectrum's still wide on how much DSM actually will cut into future load requirements, and at what cost. Recent figures from the Electric Power Research Institute say DSM could account for 30 percent of new capacity needs from 1990-2010. All but the most radical agree it's no substitute for all the projected new supply.

Even so, today's DSM has grown to a $1.5-billion per year industry, by EPRI's measure, with growth solid enough to turn supply-oriented heads.

At "The 5th National Demand-Side Management Conference," here in Boston, various speakers said DSM allows utilities to:

- Reduce peak demands and help fill valleys with installations of energy-efficient electric technologies.
- Better manage power delivery reliability and delay investments there.
- Improve customer service, value, and marketing.
- Realize gains, through regulatory in-

Continued on page 18



Free water heater wrapping—among the first conservation programs—is still widely promoted. Massachusetts Electric is part of NEES. While insulation is low-technology efficiency, the photo, right, shows high-technology—a superconducting motor. Liquid nitrogen surrounds the coils when operating. Cost-effective superconductivity could slash electricity demand.

Special DSM report: p.18

*****************5-DIGIT 20814
4100127299*090191P 000000 596
SUITE 800 COPY # 2
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

NEWS BRIEFS

JILL MINNER, Special Projects Editor

Acquisition joins Multi-Amp, Biddle, Megger

TBG Industries, a privately held international corporation and parent company of Multi-Amp Corp., announced that it has acquired Biddle Instruments and Megger Instruments Ltd, as part of a plan to form a new holding company. AVO International Inc. will encompass Multi-Amp, Biddle and Megger, according to Ruben E. Esquivel, who will serve as president and chief executive officer of the new holding company.

"The combination of Multi-Amp, Biddle and Megger establishes a strong foundation of core companies on which AVO International will continue to build and expand in the electrical test and measurement industry," Esquivel said.

AVO International will oversee and coordinate the activities of the three operating companies, while their other operating areas will continue to function independently. The top executive positions at each of the three companies will remain unchanged, according to Esquivel.

The companies and their subsidiaries will add AVO to their names for two reasons, Esquivel explained. "Biddle and Megger were owned by AVO International Ltd, the UK-based holding company acquired by TBG. Secondly, AVO is an acronym for Amperes, Volts, Ohms." The companies will now be known as AVO Multi-Amp Corp., AVO Biddle Instruments and AVO Megger Instruments Ltd.

"By bringing together the internationally recognized names of Multi-Amp, Biddle and Megger with the acronym 'AVO', we acknowledge the common electrical heritage and contributions all members of the new group have made, and will continue to make, to the electrical industry," Esquivel stated.

TBG Industries President Jack E. Haegele will be chairman of AVO International Inc.

NRC increases fees, imposes some new fees

The Nuclear Regulatory Commission announced that it is changing its licensing, inspection and annual fee schedules, in order to meet the requirements of the Omnibus Budget Reconciliation Act of 1990. Under the Act, the NRC must collect a total of $445.3 million through fees by Sept. 30, 1991. The $445.3 million represents the NRC total budget, $465 million, less the $19.7 million appropriated from the Department of Energy's Nuclear Waste Fund. The NRC said it is increasing the amount of annual fees assessed for operating power reactors from $1 million to $2.8 million.

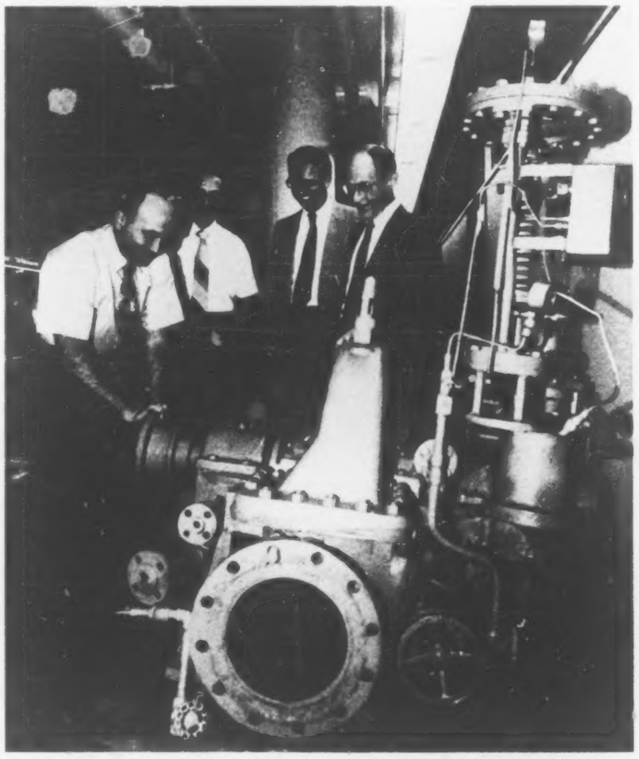
In addition, first-time annual fees will be assessed for fuel fabrication facilities, independent spent fuel storage facilities, uranium mills, transportation quality assurance approval holders and hospitals, doctors, irradiators, nuclear gauge users, and other nuclear materials licensees. Holders of registrations for sealed capsules and devices, and NRC-licensed federal agencies will also be assessed an annual fee.

In part, other revisions include: raising the cost per professional-staff hour for all full-cost fees; and increasing all flat fees for material licensees and applicants by 25 percent.

Ohio Edison donates turbine to U. of Akron

Mechanical engineering students at The University of Akron (UA) will have an actual boiler feedwater pump turbine to learn from, thanks to a donation from Ohio Edison.

The turbine, which had been used at Ohio Edison's Burger plant in Shadyside, OH, was delivered to the university's College of Engineering in June, and may be used as an instructional tool as early as this fall, according to Minel J. Braun, professor of mechanical engineering at UA. "A turbine of this type is excellent for instruction because it is easier to teach students the basics on these models," Braun explained. The turbine will be used to teach thermodynamics, fluid mechanics, turbomachinery theory, and tribology, as well as for advanced research in bearing seal technology, according to UA.



Checking out the boiler feedwater turbine Ohio Edison recently donated to The University of Akron's College of Engineering are (left to right): Minel J. Braun, professor of mechanical engineering; Benjamin T.F. Chung, head of the mechanical engineering department; Nicholas Sylvester, dean of the College of Engineering; and Douglas W. Tschappat, Ohio Edison executive vice president.

Personnel briefs

Bonneville Power Administrator James J. Jura was named general manager of **Associated Electric Cooperative Inc.** At press time, BPA had not yet named a successor for Jura.

Roger W. Kober, president and chief operating officer of **Rochester Gas and Electric Corp.**, has taken on the additional position of chief executive officer. Kober succeeds Harry G. Saddock who has relinquished his position due to health concerns. Saddock will continue to serve as chairman of the board until he retires on Dec. 31, 1991.

Iowa Southern Utilities Co. appointed René Males president. Males has served as chief operating officer of the company since March 1991.

Willard R. Holland was named president and chief operating officer of **Ohio Edison Co.** Holland succeeds Justin T. Rogers Jr. who was elected chairman and chief executive officer.

Missouri Valley Electric Association has chosen Larry D. Root as its president. Root is president and chief operating officer of **Iowa Electric Light & Power Co.**

H.Kerner Smith was elected president of the **American Boiler Manufacturers Association**. Smith is president and CEO of Riley Consolidated and Riley Stoker Corp.

Consortium dedicates supercomputing lab for global climate modeling

The first U.S. supercomputing laboratory devoted solely to modeling climate changes due to greenhouse gases has been dedicated by the Model Evaluation Consortium for Climate Assessment (MECCA). MECCA, a partnership of industry, government and academic groups from the U.S., Japan, Italy and France, performed the dedication at the National Center for Atmospheric Research in Boulder, CO.

Numerical experiments, funded through MECCA, will evaluate the reliability of current global climate simulation models by focusing on human activities and natural events such as the emissions of greenhouse gases, changing land use, deforestation or volcanic eruptions.

"Gauging the reliability of climate models will be key to both policymakers deliberating now on the risks of global climate change and to scientists of developing improved climate models in the future," explained George Hidy, vice president of the Electric Power Research Institute's environment division.

Members of MECCA have already committed a total of $12.5 million to fund the first 15 months of research. Additional sponsors are being sought so that research may continue through the full 36 months. The consortium said it expects to have results available for the June 1992 United Nations Conference on Environment and Development.

The consortium members include: EPRI and the University Corporation for Atmospheric Research (U.S.); the Central Research Institute of Electric Power Industry (Japan); the Italian Commission for Nuclear Energy and Alternative Energy Sources; and the Electricité de France.

Zimmer saves CG&E customers $1.7M

During its first full month of operation, the Wm. H. Zimmer Generating Station saved Cincinnati Gas & Electric Co. electric customers $1.7 million, according to the utility. CG&E also projected that after one year, Zimmer will produce approximately $21 million in savings. The savings will be passed on to customers through the electric fuel clause portion of its electric rates. CG&E said the savings will begin to effect customers' bills in Jan. 1992.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

NERC increases supply projections. 3,4
Heat wave boosts summer sales. 3
Demand-side management grows up—A Special Report. 1,18
Employee input cuts health-care costs. 11
NARUC Summer Meeting: Regulators look at energy policy. 12
Gradual move to automation proved effective for this G&T cooperative. 79

REGULAR FEATURES

Commentary and **Letters** 4
Marketing 19
Labor/Management Concerns 26
Information/Control Systems 36
Rate Activity 75
Calendar 77
Financial Performance 78
New Products 80
Bulletin Board 87
Readers' Service 95
Regulatory Review 97
Management Methods 98

GENERATION TECHNOLOGY

Three nuclear plants set records this year, two almost tie. 28
Waste is best handled by minimizing it before it has to be handled. 32

T&D TECHNOLOGY

IEEE/PES summer meeting outlines future challenges. 41
Transmission and distribution DSM programs offer savings. 41
Recognition awards honor IEEE/PES members. 42
New transmission lines planned by NERC regions. 44
13th IEEE/PES T&D conference and exhibition program features 45 panel sessions and over 150 technical papers. 46
Special *EL&P* show-in-print features new products by vendors and their booth location. 49
IEEE/PES T&D exhibition map shows booth location of each exhibitor. 70
Stray voltage problem aided with flow chart. 74

Heat wave helps sales; substation proposal, new supply

Utilities from the Midwest through the East set records in July as a record-breaking heat wave and high humidity sent meters spinning, while other utilities reported other capacity and reliability news.

For the record books

Commonwealth Edison Co. and Ohio Edison were among utilities setting records.

Ohio Edison Co. estimated a record 5465 MW demand on 5 p.m. on July 22, passing the Aug. 28, 1990, peak of 5394 MW. The company said '91 is the sixth consecutive year for a new peak.

Commonwealth Edison Co. broke an Aug. 17, 1988, record of 17 459 MW with a July 22 peak of 17,733 MW. In other news, the CECo continued franchise talks with Chicago in August, after stalled negotiations in early summer. Chicago's franchise with the Northern Illinois utility expires at year's end. Chicago said it may municipalize.

New England Power Pool (NEPOOL) reported a new peak for utilities within its six-state region, 19,745 MW, on July 19. Continued heat contributed to use of 19,553 MW on July 23.

That new peak exceeded the previous record of 19,722 MW on Jan. 4, 1989, and the summer peak of 19,641 MW on July 27, 1989.

General Public Utilities Corp.'s Metropolitan Edison Co. broke records July 18, 19, 22, and 23 ending with 1978 MW. That far exceeds the previous 1852-MW Dec. 21, 1989, record. Power purchases and non-utility generation helped meet demand, Met-Ed said, especially with an unexpected 32-hour outage at one Titus coal-fired unit that ended July 21.

Dayton Power & Light Co. reported a peak of 2727 MW at 4 p.m. on July 22, surpassing the Sept.6, 1990, record of 2644 MW.

American Electric Power Co. Inc.'s winter-peaking Appalachian Power Co. reported new summer peaks of 5042 MW on July 22, and 5092 MW on July 23. Those exceeded the Aug. 18, 1988, summer peak of 4993 MW. The winter peak is 5996 MW on Dec. 22, 1989. The seven-state, eight-utility AEP system also set a summer peak record, 17,556 MW, on July 22.

Puget Sound utilities' substation

Bonneville Power Administration and four Puget Sound utilities proposed a $40-million substation north of Ellensburg, WA, as a step to help prevent winter-peak blackouts in the area. No new major transmission facilities have been built for the area since 1977, BPA said.

The utilities are Seattle City Light, Puget Sound Power & Light, Tacoma Public Utilities and Snohomish County Public Utility District.

BPA plans to issue a draft environmental impact statement for public preview Oct. 1. A final decision is scheduled for spring '92.

Winter peak demand in the Puget Sound area has grown by about 200 MW per year over the past 10 years, and 400 MW over the past two years. The surge, from an regional economic boost, is expected to settle down to match the long-term forecast of 200 MW per year, BPA reported.

Adding equipment at current substations should take care of the problem through 1993, said a BPA area manager. Other alternatives would cost $210-630 million.

If demand growth exceeds 1.5 percent, a new $230-million, 500-kV transmission line across the Cascades, and 420 MW of combustion turbines for $210 million could be added. Those decisions won't come until 1996, according to BPA.

Bonneville flooded with proposals

In separate news, BPA received more than 103 projects totalling 5300 MW when the solicitation period ended for its new competitive bidding program on June 18. Forty-one conservation projects totalled 116 MW; 62 generating projects totalled 5200 MW. (See table.) No specific information about bidders or projects will be released until December, when of list of finalists will be announced. BPA seeks 300 MW of supply or savings by Dec. 31, 1997.

RFP in California

The Northern California Power Agency wants electric supply and/or demand-side management resources totaling more than 200 MW for 1995-2000. Requests for proposals are due by Nov. 12. NCPA is a Joint Power Agency based in Roseville, CA, and includes 11 municipal utilities, a rural electric cooperative, an irrigation district, and a public utility district with combined load of 1500 MW.

BPA Competitive Bidding Generation Proposals

No.	Source	MW
5	Combustion Turbines	858
15	Combined-Cycle Combustion Turbines	2546
4	Wind	69
5	Hydro	235
5	Geothermal	105
1	Biomass	9
2	Coal	119
23	Cogeneration	1248
2	Utility System Sales	20

Generation Total 5209 MW

How expensive will SO_2 allowances be?

Long Island Lighting Co. expected to announce by Aug 24 results relating to 50,000 sulfur-dioxide emissions allowances (1995-99) it put on the market this spring.

As of Aug. 13, LILCo officially would say only that "several" bids were received, declining to release more information, especially on price. One company source said more than 10 bids were received, but that could not be confirmed. May 29 was the bid deadline.

An allowance allows emission of 1 ton SO_2 per year.

Many utility planners expect allowance prices to be about $650 each in 1995, rising to $750 in 2000, said AER*X Inc. That company's new "Air Credit Trader," a Washington, DC-based newsletter, said actual market prices could be lower.

The "Compliance Strategies Review," by Fieldston Publications in Washington, DC, says utilities' median best estimate per allowance was $500 in 1995 and $700 in 2000, in 1991 dollars per ton, for a single 10,000-allowance transaction. The information was in the June 7 "CSR Emission Allowance Trading Index."

Amount of planned capacity increases

PRINCETON, NJ—U.S. utilities plan to add 89,300 MW of new generating capacity (utility and non-utility) between Jan. 1, 1991, and Dec. 31, 2000, and retire 4100 MW of existing capacity, says the North American Electric Reliability Council. Utilities in Canada project additions of 23,000 MW and retirements of 500 MW.

These figures, from the "Electricity Supply & Demand 1991-2000," have grown when compared to previously reported estimates.

Total planned capacity additions increased over those planned during the 10-yr period starting in 1988.

In 1988, NERC figures listed total additions from 1988-97 at 73.4 GW for NERC U.S. and 16.4 GW for NERC Canada.

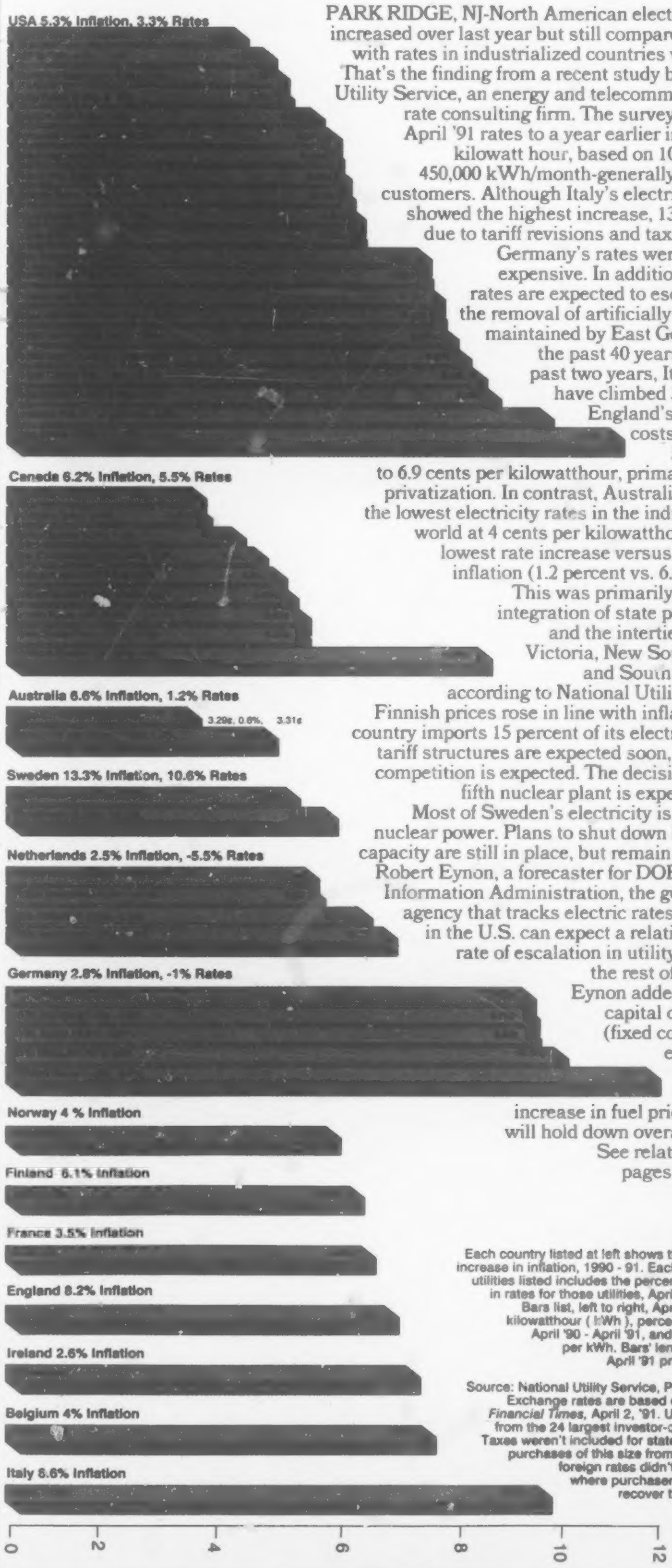
In 1991, NERC figures listed total additions from 1991-2000 at 89.3 GW for NERC U.S. and 23 GW for NERC Canada. Despite the increase in planned capacity, the amount of capacity under construction has decreased.

See tables p.4 and p.44.

The NERC report covers electricity demand, generating capacity, annual production, fossil fuel requirements, generating unit additions and retirements, transmission lines by the nine NERC regions and various subregions. It is the more detailed report upon which NERC bases its "Reliability Assessment 1991-2000."

The latest NERC report, an annual summary of electric utility supply and demand projections, may be obtained in print or on computer disk from NERC, 101 College Road East, Princeton, NJ 08540-6601; 609/452-8060.

North American industrial rates compare favorably with other countries



PARK RIDGE, NJ-North American electricity rates increased over last year but still compare favorably with rates in industrialized countries worldwide. That's the finding from a recent study by National Utility Service, an energy and telecommunications rate consulting firm. The survey compares April '91 rates to a year earlier in cents per kilowatt hour, based on 1000 kW for 450,000 kWh/month-generally industrial customers. Although Italy's electricity prices showed the highest increase, 13.9 percent, due to tariff revisions and tax increases, Germany's rates were the most expensive. In addition, German rates are expected to escalate with the removal of artificially low prices maintained by East Germany for the past 40 years. Over the past two years, Italy's rates have climbed 30 percent. England's electricity costs increased 5.6 percent to 6.9 cents per kilowatthour, primarily due to privatization. In contrast, Australia recorded the lowest electricity rates in the industrialized world at 4 cents per kilowatthour and the lowest rate increase versus the rate of inflation (1.2 percent vs. 6.6 percent). This was primarily due to the integration of state power grids and the interties between Victoria, New South Wales and South Australia, according to National Utility Service. Finnish prices rose in line with inflation. That country imports 15 percent of its electricity. New tariff structures are expected soon, as greater competition is expected. The decision about a fifth nuclear plant is expected soon. Most of Sweden's electricity is hydro and nuclear power. Plans to shut down its nuclear capacity are still in place, but remain uncertain. Robert Eynon, a forecaster for DOE's Energy Information Administration, the government agency that tracks electric rates, said, "we in the U.S. can expect a relatively small rate of escalation in utility prices for the rest of the year." Eynon added that "the capital component (fixed costs) is not expected to keep pace with the increase in fuel prices, which will hold down overall prices." See related stories, pages 27 and 75.

Each country listed at left shows the percentage increase in inflation, 1990 - 91. Each with multiple utilities listed includes the percentage increase in rates for those utilities, April '90 - April 91. Bars list, left to right, April '90 price per kilowatthour (kWh), percentage change, April '90 - April '91, and April '91 price per kWh. Bars' lengths show the April '91 prices per kWh.

Source: National Utility Service, Park Ridge, NJ. Exchange rates are based on the *London Financial Times*, April 2, '91. U.S. figures are from the 24 largest investor-owned utilities. Taxes weren't included for states that exempt purchases of this size from tax. Similarly, foreign rates didn't include taxes where purchasers were able to recover those charges.

COMMENTARY

From devastation to non-event: eight miles

The white caps fling foam before the wind in their wild race down the lake. Sheets of rain pound the window glass, turning the mountain view to a gray-green haze. Hurricane Bob is almost here.

This commentary, written in a remote cabin in the Maine woods, is punctuated with intermittent commas of darkness as the lights blink out, then burn again. This is an area where Jane and John Doe maintain their love-hate relationship with the electric company that serves them. These days the mood matches the weather—dark and stormy. At the barbershop in the nearest town I was given the full litany of Central Maine Power's sins...focused largely on "yet another rate hike." Long-time friends and residents complain of high bills and still increasing rates. That's what CMP means to many, many folks, in these parts.

But as the afternooon wore on, two miles across the water I could see lights in vacation cottages blink on as cabin-bound vacationers played games with their kids, read and watched television. Elsewhere, in the homes of year-round residents, men and women, returned from businesses closed because of the hurricane's approach, also turned to inside activities, their lawn furniture stowed, windows and screen doors latched, and outdoor toys tucked safely inside. As much as 8 inches of rain and winds—predicted to hit 75 miles per hour even on the fringes of the hurricane—are not taken lightly here. Many remember earlier blows that laid half-mile-wide swaths of 90-foot trees on the ground, lined up like so many giant toothpicks arranged in a game, and flooded businesses and homes in coastal areas.

At CMP, work crews are alerted and marshalled throughout its service area, ready to respond wherever and whenever Bob hits. The governor has just issued an emergency executive order to all residents within a quarter-of-a-mile of the ocean to leave their homes and move inland. High tide and Hurricane Bob's arrival are expected to coincide. That means the probability of extensive coastal flooding and heavy damage to homes and businesses near the shore—a worst possible scenario.

Our tiny cabin is served by a single fragile line that seemingly runs for miles from the distribution substation. As elsewhere throughout the area, we are warmed, entertained and informed through that line. And similarly are hundreds of thousands of CMP customers in the area flying before the storm.

What happens if the lights go out and stay out? How will people react? I can't help but think about the people in South Carolina when Hurricane Hugo devastated a large portion of South Carolina Electric & Gas Co.'s territory, or residents in the San Francisco Bay area were hit by the earthquake. When disaster struck there, nobody blamed the utility. Instead, work crews received accolades and hurrahs from customers. Deeds of heroism, simple dedication and personal kindnesses were saluted. Complaints about rates? "Who cares about rates? These people are getting the power back on. They're restoring our lives," customers said. The utility—with help from others—gave its all in resources and effort to restore service and help customers...and their customers knew it. Ask the folks in the SCE&G area or in Pacific Gas & Electric Co.'s territories affected by the two disasters, and you'll find few real gripes. But here the lights blink off, on, off and on again. They dim for a third time, but then brighten. The winds and rain increase. A good night to be inside. But elsewhere, we hear over the radio, people only a dozen miles away aren't so fortunate. Pleasure boats have been thrown on the shores of Lake Sebago like so many cords of firewood. It's reported that as many as 120,000 CMP customers may be without power, some for several days. One eyewitness said the area looked like a war zone. Crews in raingear are already hard at work, beginning the arduous task of restoring electric service even while the winds and rain continued, and trees were tumbled before the blast. Perhaps in areas heaviest hit by the hurricane, the CMP rate hike will be forgotten as customers witness massive restoration efforts. As elsewhere, earlier customers will laud the utility's dedication and its round-the-clock efforts.

But in our little corner of the world, where the lights still burn, people will wake to just another day. CMP's rate hike will continue to be a prime source of local aggravation. But until the lights go back on throughout CMP's territory, perhaps the rate issues will remain a secondary interest.

Robert A. Lincicome, Editor-in-Chief, from Hancock Pond, ME

EL&P ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher
Robert A. Lincicome
Editor-in-Chief

PennWell PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
Dianne Wilson, Editorial Assistant-Products/Literature
B. J. Davidson, Bulletin Board Coordinator
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1991 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402; (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Micro-Photo Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIGHT & POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP

Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

LETTERS

Fossil-Fuels Focus Report

The otherwise superb May Article, "Focus—Fossil Fuels" (pp.25-30), contained an oversight that I would like to correct. Regarding dry, low-NOx combustors, you state correctly that they operate without heat-rate penalty and added maintenance due to water or steam injection, and without the high capital investment and potential operating problems of SCRs.

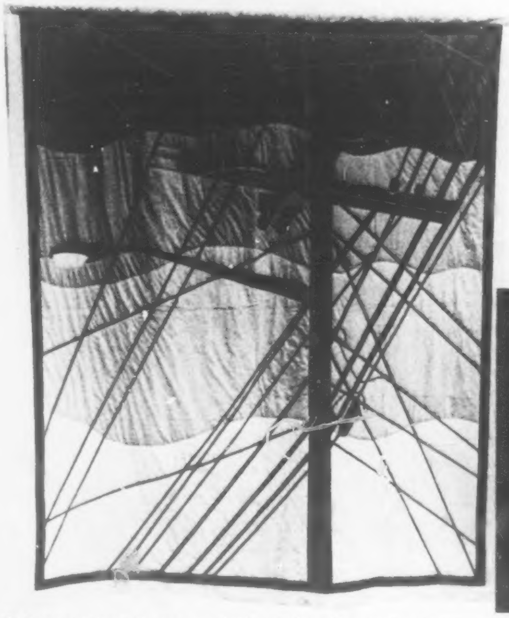
However, you go on to say that dry, low-NOx combustors "...are still under development, and those in the field do not have the track record of water and steam injection."

Apparently you are unaware that since 1986 Siemens has installed dry combustors in over 30 units, now with more than 150,000 service hours. This obviously is a "track record" of which we are quite proud.

Jim R. Thompson
Deputy General Manager
Combustion Turbine Group
Siemens Power Corp.

Editor's note—We stand corrected. While we stick with our statement that many low-NOx combustors still are under development, we may have overstressed their developmental status. We appreciate the update.

Beauty is in the eye of the beholder



This unusual quilt was made by a New Hampshire woman for Malcolm Wells, a Cape Cod (MA) architect, who wanted to commemorate the existence of poles and wires, which he says will someday be things of the past. Wells converted a photo (r) into the design for the quilt. On display at Wells' Underground Gallery in Brewster, MA, the 82"x96" quilt is for sale.

Construction Status of Generating Unit Additions (Thousands of MW) Projections 1991 - 2000

See story p. 3	United States	Canada
Coal	15.1	1.9
Not Yet Under Construction[b]	9.0	0.4
Under Construction	6.1	1.5
Nuclear	5.9	2.6
Not Yet Under Construction[b]	0.0	0.0
Under Construction	5.9	2.6
Hydro	1.1	12.7
Not Yet Under Construction[b]	0.8	7.3
Under Construction	0.3	5.4
Oil/Gas	34.2	2.3
Not Yet Under Construction[b]	33.0	1.9
Under Construction	1.2	0.4
Pumped Storage	2.5	0.0
Not Yet Under Construction[b]	0.2	0.0
Under Construction	2.3	0.0
Other (Utility)[c]	12.8	1.1
Not Yet Under Construction[b]	12.7	1.1
Under Construction	0.1	0.0
Total (Utility)	71.6	20.6
Not Yet Under Construction[b]	55.7	10.7
Under Construction	15.9	9.9
Non-Utility Generators	17.7	2.4
Total (All Additions)	89.3	23.0
Retirements	4.1	0.5

[a] Perry 2, WNP 1, and WNP 3 are in some stage of construction but are not included.
[b] Includes utility units planned but utility authorized, units with regulatory approval pending, and units with regulatory approval received but not yet under construction.
[c] Includes utility capacity powered by geothermal, wind, solar, wood, refuse, and similar energy sources and capacity of unspecified fuel type.

Source: North American Electric Reliability Council, July 1991, "Electricity Supply & Demand 1991 - 2000"

CMS energy will not contest $1.5-B order

DEARBORN, MI—CMS Energy Corp. agreed to return $1.5-billion debt and equity interest in Midland Cogeneration Venture (MCV) to utility subsidiary Consumers Power Co.

CMS Energy said it would not appeal a recent Michigan Court of Appeals decision to affirm a May 23, 1990, Michigan Public Service Commission order requiring return of the debt and equity.

CMS Energy said it would return $1.2 billion of marketable bonds and about $300 million of equity interest to Consumers Power and extinguish the CMS debenture held by Consumers Power which was received for the MCV interests.

Consumers Power Co. will use the funds to reduce debt and increase investment to improve customer service.

Corrections

SAN DIEGO—San Diego Gas & Electric purchased one transformer from Smit, a Dutch firm, for the Peñasquitos substation project (*EL&P*,p.3,6/91). One 230-69-kV transformer has been added. Two 230-138-kV transformers will be added, but haven't been purchased. SDG&E is rearranging the existing 69-kV yard as part of that project.

SDG&E has 1.1-million customers. Southern California Edison has about 4-million customers (*EL&P*,p.1,6/91).

EL&P regrets the errors.

GENERATION UPDATE

HENRY STEIN, Senior Editor-Generation

Three nuclear power units set industry output records in 1991

WASHINGTON—Within hours of each other, two nuclear power units were the first and second ones to reach total production of 100 GWh of electricity output. In the meantime, a third unit set a record for the longest uninterrupted operating run.

Duke Power Co.'s Oconee-1, near Clemson, SC, was the first to reach the production record, at 10:39 a.m. on July 28. Indiana Michigan Power Co.'s Donald C. Cook-1, near St. Joseph, MI, was the second at 1:50 p.m. on the same day.

Three Mile Island-1 set the record for the longest uninterrupted operating run on July 22, having operated for 478 consecutive days.

Vying for the record

"The Cook, Oconee and Three Mile Island plants stand among the top performers of the nuclear plants that came into service during the 1970s," said Phillip Bayne, president of the U.S. Council for Energy Awareness (USCEA). He added that the three units are examples of a wider industry trend. "They're proof positive that America's 111 nuclear plants aren't [just] getting older, they're getting better."

Oconee-1 entered service in 1973 and, along with two sister units, supplied 30 percent of the total electricity for Duke Power's customers in 1990. The three units operated at 90 percent of their maximum capacity last year.

Cook-1 began commercial operation in 1975. In 1990, it and its sister unit supplied over 11 percent of the total electricity needs for the 2.5-million customers of Indiana Michigan's parent American Electric Power Co. Inc.

Class by itself

TMI-1 entered service in 1974. It achieved its record run four weeks after being named by the Nuclear Regulatory Commission as one of the four safest nuclear plants in the country. Its operating run was the longest of any U.S. commercial nuclear power unit and the longest continuous run of any light water reactor in the world, according to USCEA. General Public Utilities Corp.'s GPU Nuclear operates TMI-1. Most reactors are the light water type.

The record run began in March 1990, and the plant is not scheduled to shut down for routine refueling and maintenance until the end of September.

Unit 1's 478-day run surpasses the previous record of 477 days made in 1988 by Omaha Public Power District's Fort Calhoun Station, in Nebraska.

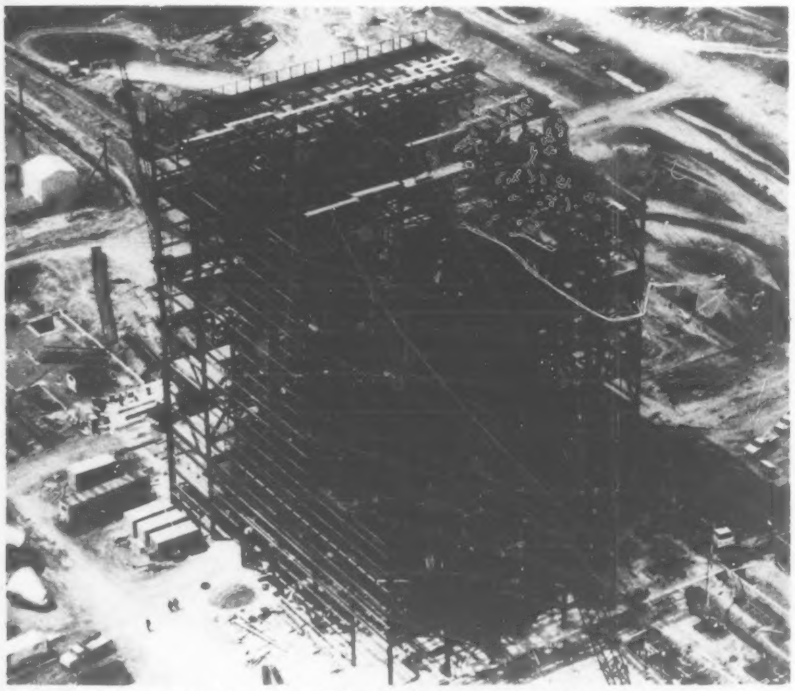
During its 16-month run, TMI-1 also earned the highest rating in each of seven inspection categories in a comprehensive NRC assessment, the Systematic Assessment of Licensee Performance, which is much better known by its initials, SALP.

New utility power plant being built in Nova Scotia

CHICAGO—The steam drum for the 165-MW Point Aconi power plant was raised into place on June 7, a week ahead of schedule. The plant is being built in Cape Breton County, Nova Scotia, for Nova Scotia Power Corp. with Mitsui & Co. (Canada) Ltd. as prime contractor and Sargent & Lundy as project manager and architect/engineer.

Chicago-based Sargent & Lundy says this single-boiler plant is one of the world's largest circulating fluidized-bed (CFB) boilers.

It will burn local Cape Breton high-sulfur coal (3-5 percent sulfur) and remove 90 percent of the SO_2 emissions. In addition, it says the CFB will have inherent NOx control. The first unit is scheduled for operation in 1993. Additional units may be added later.



It's up, up and away as the steam drum is lifted into the steel skeleton of a new power plant undergoing construction in Cape Breton County, Nova Scotia

NUGs doing well, future in doubt

NEW YORK—Non-utility electric generating (NUG) capacity from cogenerators and small power producers reached 38 GW at the end of 1990. Estimates suggest another 22 GW may be added by 1995.

Frost & Sullivan International, the market research firm, reached these conclusions after performing a study that focused on large cogeneration systems of 500 kW to over 100 MW.

More and bigger

The study found a rapidly growing trend toward larger-size gas turbines for cogeneration—average turbine size in these applications increased from 24 MW in 1988 to 34 MW in 1990.

However, the firm's analysis of large-size cogeneration systems also concluded that growth in the number of annual additions will peak in the next few years and then decline in the long term.

In fact, the report on the study maintains that after the year 2000, technological improvements will help make nuclear power a viable option once more. In addition, utilities will again begin ordering and building low-unit-cost central stations to the point where they will become the dominant factor in capacity additions.

Deja vu all over again

This turn of events will show history repeating itself. In 1900, about 60 percent of U.S. electric generating capacity was self-generated. But by 1940 less than 35 percent was user-generated, and this amount declined to less than 10 percent by the 1970s.

Congress passed the Public Utility Regulatory Policies Act (PURPA) in

Continued on page 30

SCE&G announces plans for new baseload coal plant

COLUMBIA, SC—South Carolina Electric & Gas Co. announced late in June that it will build a new coal-fired, baseload plant near the town of Cope, SC, about 25 miles south of Columbia.

The 385-MW facility will become the sixth coal-based baseload plant on SCE&G's system and the company's first major construction project since its V.C. Sumner Nuclear Station was begun in 1974.

Equipment and systems

The plant will consist of a single pulverized-coal boiler, dry scrubber and turbine-generator located on a 3000-acre plot, one that will allow for future expansion.

The boiler will be able to burn 148 tons of coal per hour when operating at 100-percent capacity. The coal will be delivered by CSX Railroad on trackage adjacent to the site.

The plant's dry scrubber will hold SO_2 emissions to 0.34 lb/MBtu or 90-percent removal, whichever is more stringent.

Flyash and the lime byproduct from the scrubber will be removed from the exhaust gases in fiberglass baghouses, then loaded into dump trucks and hauled to an onsite disposal area designed to meet current environmental standards.

The brick-lined concrete chimney will

Continued on page 38

Today's baghouses are better, more dependable

PALO ALTO, CA—Current utility baghouses have longer lives and operate better those in the past.

Bag life increased significantly since the first installations in the 1970s. Guaranteed bag life of three years has become typical for new installations, and average bag failure rates have stabilized to approximately 1 percent of installed bag capacity.

Operation, maintenance

Operation and maintanance no longer are problems, according to utilities answering a survey and site visits conducted by the Electric Power Research Institute in 1989 and reported recently. Maintenance problems appear to be independent of boiler type, fuel type, startup method and startup fuel.

In most cases, baghouse problems do not reduce boiler availability. They are being corrected in-service or during scheduled outages.

Operating parameters

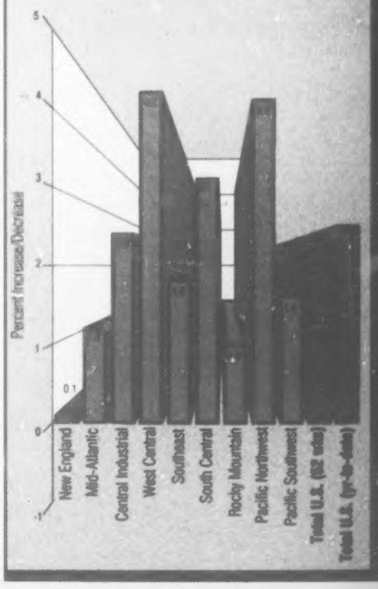
Other findings are that current baghouses operate at a gross air-to-cloth ratio of 1.5-2.0 fpm for reverse-gas and 2.5-3.0 fpm for shake-deflate cleaning. Many reverse-gas-cleaned baghouses

Continued on page 31

ELECTRIC OUTPUT

Some Growth Slowed

Net electric output from the Mainland U.S. electric utility industry increased for the 52 weeks ending July 26, as reported by Edison Electric Institute. New England's growth rate fell from 0.6 percent for the 52 weeks ending June 29.



Recent EPA activities affect utilities; clean-air regs, climate

WASHINGTON—Various Environmental Protection Agency (EPA) actions on clean-air regulations, handling hazardous wastes and global-climate concerns are among those impacting utilities recently.

Acid rain reduction

EPA has released for public comment, the draft document necessary for carrying out the Phase II acid rain reduction program under the Clean Air Act Amendments of 1990.

The agency also prepared a computerized database designed to help utilities and other affected.

Phase II, which begins in 2000, will fulfill President Bush's goal of cutting SO_2 emissions in half.

As previously reported, it will also permanently cap annual SO_2 emissions at 8.9-million tons nationwide. Halving SO_2 emissions under the new Act represents a 10-million-ton reduction from 1980 levels.

The cut will be accomplished in two phases: Phase I, beginning in 1995, for the largest power plants; Phase II, beginning in 2000, for smaller plants. The acid-rain program includes a market-based trading system of SO_2 allowances, which gives affected sources (mainly exisiting power plants) the right to emit one ton of SO_2.

If a source does not use up its allowances, it can sell the remaining emission rights to another utility or bank them for future use. Allowances are based on emission rates, previous level of coal, oil or other fuel use.

In the new Act, Congress specifically named 110 plants as subject to Phase I requirements. EPA will determine facilities affected by Phase II and their allowance allocations.

The National Allowance Database (version 2.0) contains a variety of information by state and by utility on such things as total generating capacity and total amount of SO_2 emitted into the atmosphere annually.

EPA has established a hotline—703/218-2716—for obtaining information about the database and technical support documents.

The EPA database for calculating SO_2 allowances was published July 19 in the Federal Register. Utilities have 45 days to review the information for accuracy, noted the American Public Power Association, in its *Public Power Weekly* newsletter.

Innovative technologies

EPA will develop a new database—The Vendor Information System for Innovative Treatment Technolgies (VISITT)—to make information about innovative technologies regarding hazardous waste cleanup more widely available. The database will be available in early 1992.

EPA invites vendors to submit their capabilities for use in the database. Forms must be submitted by Sep [illegible], 1991, to be included in the first release of the database.

VISITT will include information on vendors that treat groundwater, soil, sludge, sediments and solid wastes. It will *not* include incineration, solidification/stabilization and traditional pump-and-treat for groundwater. The VISITT database will be updated at least annually.

Call 800/245-4505 for additional information. Forms for vendors can be obtained from EPA's Office of Research and Development, Publications, at 513/569-7562.

Global warming

EPA's new report *Methane Emissions From Coal Mining* is the second in a series of reports on methane control options. Methane gas is expected to contribute 20 percent to future global warming. Coal mining will contribute an estimated 7 to 12 percent of atmospheric methane.

The report estimates methane emission from coal mining by country, evaluates control technologies available and assesses the economics of methane recovery during mining.

Top 100 correction

The heat rate for fossil-fueled boilers listed in Table 5 of the Top 100 operating report (*EL&P*, 8/91, p.20) for Florida Progress Corp. was recorded incorrectly. The actual rate in 1990 was 9821 Btu/kWh, which moves the company to the No. 4 place in the table.

from page 31

GT shipment...

tured in Westinghouse facilities in Charlotte, NC; Winston-Salem, NC; Fort Payne, AL; and Hamilton, Ontario, Canada.

The company said that cumulative operating data for domestic 501D5 combustion turbines, compiled since startup, show an average reliability of 99 percent and average availability of 95 percent.

The 501D5 features three distinctive design elements:

- *Cold end drive.* The generator drives from the compressor end of the turbine, instead of the hot exhaust end, thereby allowing thermal expansion to occur toward the rear of the unit. This eliminates the need for a flexible generator coupling and improves reliability and availability.
- *Axial exhaust.* Made possible through the cold-end design, this feature enhances efficiency by eliminating side-exhaust turning losses.
- *Two-bearing construction.* Simplifies maintenance and reduces the potential for problems that can occur with a center bearing located in the hot combustion area.

On the Pile

or Around the Powerhouse...

...you never know what job will surface next. Handling and stockpiling coal is a challenge in itself, but those odd jobs that pop up around every corner can really drive a manager crazy!

Caterpillar has long been known for its track and wheel dozers, scrapers and wheel loaders which move mountains of coal to keep you ahead of the game. But Cat also makes several models of utility machines designed to handle those odd jobs.

Cat® IT12, IT18B and IT28B Integrated Toolcarriers. Each model can be equipped with four sizes of general purpose buckets, or a high-capacity coal bucket. They can do anything a wheel loader can, then perform an endless variety of tasks by switching to any of almost 100 different tools...forks, dozer blades, snow plows, brooms, material handling arms, or even a claw-like grapple called a Tire Hand. Equipped with a quick coupler, these machines can change tools in less than 30 seconds.

Cat 416, 426 and 436 Backhoe Loaders. Ideal for trenching and general excavation around the powerhouse, these units are truly tops in their class. They're easy to operate and feature on-the-go shifting in all gears for both two or four-wheel drive. Unlike most other makes, Cat Backhoe Loaders use load-sensing hydraulics which match hydraulic flow and pressure to work demands.

Call your Cat® Dealer today. He'll be glad to show you how these machines can help solve some of your most difficult problems.

CATERPILLAR

© 1989 Caterpillar

Inquire R.S. 22

NERC regions plan to add new transmission lines

PRINCETON, NJ—U.S. electric utilities will add 12 600 circuit miles of transmission lines operating at voltages of 230 kV or higher in the next 10 years, according to the North American Electric Reliability Council's Electricity Supply & Demand 1991-2000 report.

Canadian utilities will add 8800 circuit miles to their existing 41,000 circuit miles. Current circuit miles (Dec. 31, 1990) in the U.S. for this voltage range are 147,000.

Some 287-kV and 360-kV lines are included in the 345-kV category for the Western Systems Coordinating Council. For Quebec, the 345-kV category represents 315-kV lines and the 765-kV category represents 735-kV lines.

Existing Circuit Miles:

kVac	U.S.	Canada
230	70.511	22.207
345	47.948	5.265
500	23.958	5.353
765	2.428	6.257
kVdc		
250-400	465	47
400	436	0
450	192	1.934
500	1.333	0

Planned Additions 1991-1995:

kVac	U.S.	Canada
230	3.182	1.407
345	1.906	689
500	1.729	766
765	0	768
kVdc		
450	0	1

Planned Additions 1996-2000:

kVac	U.S.	Canada
230	1.737	1.205
345	1.677	890
500	2.308	1.561
765	110	1.040

Long Island gets new power source

HEMPSTEAD, NY—The Long Island Sound Cable Project was officially inaugurated May 30 in ceremonies at which Governor Mario Cuomo threw the switch that energized cables bringing low-cost power from Canada and upstate New York to Long Island.

This New York Power Authority project was completed 18 months ahead of schedule. Pirelli Cable Corp., Florham Park, NJ, supplied and installed the 32 miles of double-armored cable. "This is the largest self-contained, fluid-filled cable ever used in the U.S.," said James McCourt, vice president of Pirelli Cable Systems Division.

The cable was manufactured in Italy and transported to New York by the specially equipped Pirelli cableship *Giulio Verne*. The 345-kV cable measures more than 15 cm in diam. with each foot weighing nearly 60 lb (90 kg/m), for a total weight of 60 tons.

Four cables were laid under the Sound from New Rochelle in Westchester County, NY, to Hempstead where a Long Island Lighting Co. substation will distribute the power to area customers. One of the cables will serve as a spare for the 670-MW capacity circuit.

Continued on page 74

from page 41

DSM program...

grew out of a regulatory stipulation that a local area load forecast and an assessment of the potential load reductions from DSM accompany any filing for transmission line upgrades based on load growth.

The project began with forecasting and DSM assessment for its 14 transmission areas, regions defined by geographic and circuit similarity rather than by any reference to political or internal corporate designations.

CMP's first two local area load forecasting and DSM assessment efforts indicated limitation on the econometric approach to forecasting on the local level. AST's technique—a spatial load forecasting method—overcame many of these restrictions.

AST will produce a report for each of the 14 transmission areas and assess load reduction from each of 32 DSM technologies and a coordinated group of 15. The data will provide the first clue to the potential for demand-side load reduction on a regional level.

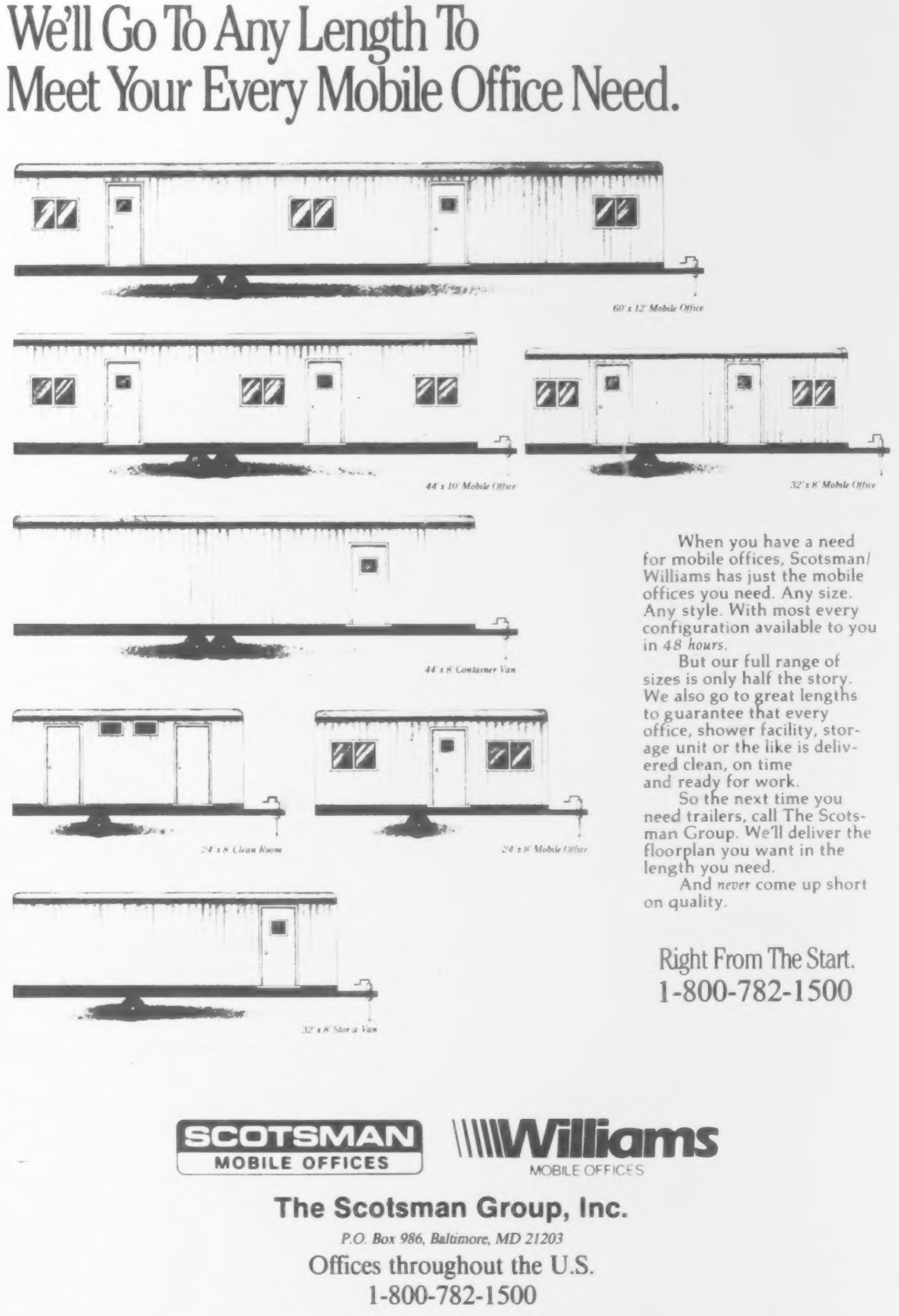
Complicated technology

ABB's AST group says that achieving significant savings with an integrated T&D DSM program requires an understanding and treatment of the complexities that exist between the characteristics of DSM and its impacts on the T&D system. Complicating elements of DSM and T&D include load coincidence changes, market penetration levels, and geographical distribution of customer classes. The techniques are considerably more complex and involved than at the generation level, according to ABB's Lawrence Vogt, Lee Willis, and Lynn Ribar.

The same DSM program can yield a large savings in one area, overshift load in another to the point of creating a higher local peak, and yet make no impact at all in a third area.

For this reason, DSM programs successfully aimed at T&D savings must be coordinated carefully with local needs thoughout the utility system.

Other utilities that are analyzing DSM from the total system perspective include Gulf Power Co., Newfoundland Power, Bonneville Power Administration and the City of Austin (TX) Electric Department.



We'll Go To Any Length To Meet Your Every Mobile Office Need.

When you have a need for mobile offices, Scotsman/Williams has just the mobile offices you need. Any size. Any style. With most every configuration available to you in *48 hours*.

But our full range of sizes is only half the story. We also go to great lengths to guarantee that every office, shower facility, storage unit or the like is delivered clean, on time and ready for work.

So the next time you need trailers, call The Scotsman Group. We'll deliver the floorplan you want in the length you need.

And *never* come up short on quality.

Right From The Start.
1-800-782-1500

The Scotsman Group, Inc.
P.O. Box 986, Baltimore, MD 21203
Offices throughout the U.S.
1-800-782-1500

Inquire R.S. 30

C6985-6A

ELECTRIC LIGHT & POWER

EL&P

OCTOBER 1991
Volume 69, Number 10
A PENNWELL PUBLICATION

VOICE OF THE ELECTRIC UTILITY INDUSTRY

LATE NEWS

Northeast Utilities asked the Federal Energy Regulatory Commission to reconsider some T-access conditions for acquisition of PSNH. Without changes, the deal might fall apart (*EL&P*,9/91,p.1). **Wisconsin Public Power** Inc. claims, in a FERC filing, that Northern States Power influenced others to not allow WPPI to fully participate in the Mid-Continent Area Power Pool, which saves wheeling costs. The two compete. **NRC staff** OK'd restart of Nine Mile Point 2 Sept. 18, after a shutdown and investigations, p.18.

H-Q, NY delay deal

Soft demand, James Bay, flooding, human rights

NEW YORK—New York Power Authority and Hydro-Quebec agreed to an 11-month delay in signing a 21-year, 1000-MW firm-power contract. They have until Nov. 30, 1992, to review terms.

The contract value to H-Q has been estimated at $12-15 billion.

Circumstances changed since NYPA and H-Q agreed to the deal on April 26, 1989. Demand in New York has grown slower than expected. Additional environmental reviews are required prior to expansion of the James Bay hydroelectric project, which is H-Q's planned supply for the contract.

Cree and Innuit natives oppose the James Bay expansion because of human rights issues and loss of land.

H-Q was to provide 1000 MW to New York starting in 1995, mostly for Long Island and New York City. It would reduce the need for oil-fired capacity.

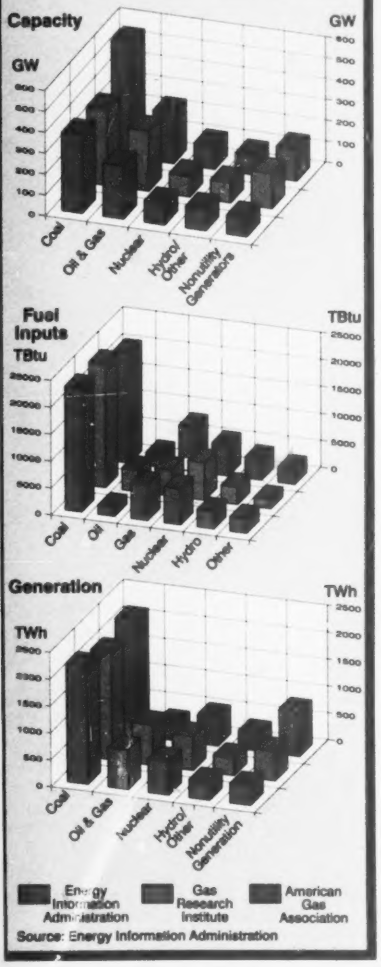
To supply the power, H-Q advanced the due date for finishing James Bay by three years. The next stage would flood about 400 mi^2. A later James Bay stage would flood several times that area. Both add to just a fraction of the 410,000-mi^2 area of the James Bay and Northern-Quebec territory, said H-Q.

A September Canadian federal court decision may delay the part of the project located on the Great Whale River. The court said an independent federal environmental review was needed to satisfy a previous federal agreement with the Cree. An appeal seems likely.

Consolidated Edison Co. and Long Island Lighting Co., which could take as much as 70 percent of the power, had favored the contract extension, as did New York State and City governments. Area demand growth has softened, partly from improving demand-side management and wholesale market.

On Aug. 29, Gov. Mario M. Cuomo directed the New York State Energy Planning Board to develop, by March 1992, an environmental impact statement on the possible effects of cancelling the contract. That board will also evaluate the cost of alternate supply, impacts of Clean Air Act Amendments, fuel diversity, dependence on foreign oil, and alternate demand and supply options.

COMPARISONS OF ELECTRIC POWER PROJECTIONS: 2010



Source: Energy Information Administration

BPA, PacifiCorp agree to construct Third AC Intertie

PORTLAND, OR—Bonneville Power Authority and PacifiCorp agreed to build a $105-million transmission line, the final major phase of the Third AC Intertie Project in the Northwest.

The line, from Eugene to Medford, OR, has a target completion of November 1993. It will add 800 MW to the third Northwest to Southwest link, bringing the totai for the third portion to1600 MW, and the total capability of the AC Intertie to 4800 MW.

Negotiations were underway, as of the Aug. 20 announcement, to complete a long-term interconnection agreement between the Northwest and California parties. It would include provisions for operating and maintaining the third link.

Hurricane Bob was here. Above emergency personnel in Boston Edison territory direct residents away from downed lines. Below, in blue, a split pole and tree lean parallel in LILCo's area.

Advance plans helped utilities recover from Hurricane Bob

Cleanup continues after Hurricane Bob caused an estimated 2.1-million power outages, from the Carolinas to Maine, Aug. 18-20. With 138-mph gusts, damage centered on east Long Island north and east through New England.

Various reports from the region indicated that advanced preparations reduced deaths, injuries and damages (*EL&P*, 9/91, pp.1,4), and assisted with recovery.

Significant damage was reported at utilities including Boston Edison, Central Maine Power, Commonwealth Energy System, Eastern Utilities Associates, Long Island Lighting Co., New England Electric System, Northeast Utilities, Public Service Co. New Hampshire, United Illuminating, and UNITIL Corp.

Some accounts likened the worst damage to a war zone.

Utilities having advance notice were able to alert crews in advance of the storm, prepare stockpiles, and make other needed emergency arrangements. Residents were given and most heeded advance notice to move inland.

High tide and Hurricane Bob's arrival coincided in some areas in New England, causing greater coastal flooding and heavy damage to homes, businesses, and facilities near the shore.

New England Power Pool (NEPOOL) reported 1.7-million outages out of 5.95-million customers. "Parts of coastal Massachusetts and New Hampshire got creamed," said NEPOOL's William P. Sheperdson.

Despite that, "Except for Cape Cod outages, most of the load was lost from distribution outages," Sheperdson said. During the storm, NEPOOL's load dropped from 16,137 MW to about 9000 MW. Available thermal units were started before the storm, in anticipation of tripping and possible "islanding," Sheperdson said.

Eight NEPOOL generators totalling 1800 MW were forced off, including two Canal units for 1143 MW; Salem Harbor 4, 430 MW; and Somerset 6, 105 MW. None of the NEPOOL generating outages affected neighboring utilities or pools, he added.

The storm, and sudden loss of load, tripped three 345-kV lines and 27 115-kV lines within NEPOOL.

Commonwealth Energy System's Commonwealth Electric Co., serving the Cape Cod area of Massachusetts, may have gotten hit "the worst of any utility," according to one source.

Michael O'Malley, spokesperson for Commonwealth Electric Co. said the storm hit by 3 p.m. Monday Aug. 19. With all 304,000 customers disconnected, winds in excess of 115 mph, $12-15 million in overhead and underground damages, Bob was three to four times as bad as Gloria.

"There was no doubt about the severity," he said.

O'Malley cited "a tremendous amount of tree damage; the worst I've ever seen, and I've been with the company since 1972."

The state helped clear Cape Cod roads with heavy equipment; 400

Continued on page 8

****************5-DIGIT 20814
4100127302*10019IP 000000 1482
SUITE 800 COPY #1
SRI
CONGRESSIONAL INFO SERVICE0021
4520 EAST WEST HWY
BETHESDA MD 20814

NEWS BRIEFS

JILL MINNER, Special Projects Editor

Met-Ed, JCP&L use pumped storage power

Metropolitan Edison Co. and Jersey Central Power and Light Co. signed a three-year contract to receive 172 MW and 140 MW respectively from the Seneca Pumped-Storage Hydroelectric Station. The contract was made between the utilities' parent company, General Public Utilities, and Cleveland Electric Illuminating Co., 80-percent owner of the Seneca plant.

"The pumped-storage operation permits us to produce power to meet peak demand on our system with maximum efficiency," stated Henry L. Robidoux, Met-Ed vice president of transmission and distribution-engineering operations.

MagneTek, Soviets to form joint venture

MagneTek Inc., a power equipment service company, and the Soviet Union's largest power equipment builders have signed an agreement in principle to form a jointly owned subsidiary to be named MagneTek Power Inc. The agreement calls for MagneTek Power to design, manufacture, install and service electric power equipment for utilities and other electric power producers.

The Soviet participants, Electrosila and Leningradsky Metallichesky Zavod, will own 49 percent of the new subsidiary while MagneTek will own 51 percent.

According to MagneTek President and CEO Frank Perna Jr., the agreement will result in the first U.S.-based, Soviet-American joint venture involving a major U.S. corporation. In addition, the agreement paves the way for equity investments between the partners.

MGE appoints officers

Frank C. Vondrasek, president and chief operating officer of Madison Gas and Electric Co., was appointed chairman and chief executive officer of the utility. MGE Senior Vice President and General Counsel David C. Mebane succeeds Vondrasek as president and COO.

Industry awards

Pennsylvania Power & Light Co. and **Pacific Power & Light Co.** have received Edison Electric Institute's 1991 National Land Management Awards for programs that benefit the environment and the community. Pennsylvania Power & Light won in the overall land management category for its implementation of a multi-site land management program that encompasses almost 40,000 acres in eastern Pennsylvania. Pacific Power received a land management project award for its wildlife habitat management program at the Merwin Hydroelectric Project in western Washington.

Detroit Edison Co.'s power plant emissions reduction program earned an environmental achievement award in the National Environmental Awards Council's "Search for Success." The utility was recognized for a 60-percent reduction in power-plant sulfur-dioxide emissions from 1975 through 1990, despite a nearly 20-percent increase in net generation from fossil fuels.

San Diego Gas & Electric Co. won AM/FM International's Pioneer Award at the 1991 Executive Management Symposium for its development and use of an AM/FM system. The utility improves service to customers and delivers collateral benefits to the surrounding communities through data sharing and access.

Consumers Power Co. was honored with a Silver Screen Award by the U.S. Industrial Film and Video Festival for its video presentation on the successful conversion of the Midland nuclear plant to the gas-fired Midland Cogeneration Venture.

Tennessee Valley Authority received the Alliance for Environmental Education's Award for Service for its help in establishing a network of environmental education centers across the nation.

Central Maine Power Co. was named "Cogeneration Utility of the Year" by the American Electrical Engineers' Cogeneration Institute.

FERC may discontinue use of benchmark ROR

In its eighth annual proceeding on the generic determination of rate of return (ROR) on common equity for jurisdictional electric utilities, the Federal Energy Regulatory Commission said it is seeking comments on whether or not it should discontinue the rule.

The benchmark ROR is intended to be used as a guide for parties in rate proceedings and as a reference point for the commission in setting allowed rates of return. FERC however, said it is questioning the rule's usefulness.

IN THIS ISSUE

HIGHLIGHTS

INDUSTRY NEWS

Hydro-Quebec agrees to delay 1000-MW deal with NYPA. 1
Advanced planning helps Hurricane Bob recovery; regulators give NY, MI utilities advice. 1,3
Midwest Energy seeks utilities' merger; PE reorganizes. 14
Regulators may avoid TEP bankruptcy; more on TU's $1-billion charge. 16

T&D TECHNOLOGY

Open-conductor faults detected and isolated reliably. 27
EMF issue is serious one for utilities in the 1990s. 27
NIPSCO installs fault-tolerant EMS/SCADA system. 28
Oglethorpe upgrades control center. 32
Fault and disturbance analysis conference set by Texas A&M. 32

GENERATION TECHNOLOGY

Nine Mile Point Station problems are being investigated by a special NRC task force. 18
Overseas nuclear problems may adversely affect future plans in the U.S. 18
Navajo Station owners agreed to retrofit to limit SO_2 emissions. 18
Utilities are working hard to clean the air, as this update shows. 20

REGULAR FEATURES

Commentary 4
Labor/Management Concerns 17
Financial Performance 23
Information/Control Systems 26
Calendar 34
New Products, New Literature 35, 41
Readers' Service 39
Regulatory Review 43
Management Methods 44

ANF buys FPL subsid.

FPL Group Inc., parent of Florida Power & Light Co., has sold one of its subsidiaries, Qual-Tec Testing Services Inc. (QTS), to Advanced Nuclear Fuels Corp. (ANF), a Siemens company. ANF said it will integrate the QTS organization into its nuclear services subsidiary Universal Testing Laboratories Inc. (UTL).

ANF said the acquisition will enhance UTL's ability to provide full-scope in-service inspection services by adding complete testing, refurbishment and visual examination capability for snubbers and pipe supports to the present scope of nuclear plant services.

DOE to sponsor solar car competition

The Department of Energy has announced that it will sponsor an intercollegiate, cross-country solar car competition to be held June 20-26, 1993. The SUNRAYCE '93 course will begin in Dallas, TX, and finish in Minneapolis, MN.

"This competition will serve as a symbol of our commitment, outlined in the President's National Energy Strategy, of encouraging technology that will produce renewable energy that is both practical and affordable to the public," stated Deputy Secretary of Energy W. Henson Moore. "To accomplish this, we need the type of creativity and entrepreneurial spirit that will be brought to this race by the young men and women who enter it."

Up to 36 universities and technical institutes have been selected to participate in the competition, according to DOE. The Solar Energy Research Institute in Golden, CO, will serve as national race headquarters.

Non-licensees now can be fined for deliberate misconduct, says NRC

The Nuclear Regulatory Commission has amended its regulations to make all persons, including non-licensees, subject to enforcement actions for deliberate misconduct involving NRC-licensed activities.

According to the NRC, deliberate misconduct includes: 1) actions that cause or, but for detection, would have caused a licensee to be in violation of any rule, regulation, order or any term, condition or limitation of any license; and 2) deliberate submission of incomplete or inaccurate information to the NRC, a licensee, contractor or subcontractor.

Deliberate misconduct could result in notices of violation, orders and civil penalties for all involved, according to the commission. The amendments went into effect on Sept. 16.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Carolina Power & Light
A $50,000 civil penalty for alleged violations of NRC requirements at the Shearon Harris nuclear power plant. The penalty was proposed because plant personnel failed to maintain two operable reactor trip system instrumentation channels, and did not ensure that operations personnel were properly notified prior to placement and removal of electrical jumpers during system testing.

Florida Power and Light
A $37,500 civil penalty for alleged violation of NRC requirements at the St. Lucie nuclear power plant. The penalty was proposed due to problems with the containment spray systems in Unit 2.

Houston Lighting & Power Co.
A $75,000 fine for violations o requirements at the South Texas Project. The action involved a system which the NRC requires pressurized water reactor plants like STP to have. In Units 1 and 2, both systems had been shut down 36 percent and 15 percent of the tim respectively, while the plan was above the 40-percent power level.

New York Power Authority
A $137,500 fine for alleged violations related to the inadvertent and unmonitored releas of low-level radioactive material from the James A. FitzPatrick Nuclear Power Plant.

Northeast Nuclear Energy Co.
A $50,000 fine for failing to follow written procedures at the Millstone Unit 1 Nuclear Power Station. The procedures require the shift supervisor to shut down all four circulating water pumps whenever control room indicators show too great an increase of water pressure building up.

Public Service Company of Colorado
A $62,500 fine for violations of NRC radiation-protection requirements at the Fort St. Vrain nuclear facility. The action was taken because of an incident involving low-level radiation exposures to a mechanic and a health physics technician.

Tennessee Valley Authority
A $75,000 civil penalty for alleged violation of NRC requirements at the Browns Ferry nuclear power plant. TVA was penalized after both Unit 2 drywell personnel access doors were open at the same time for about four hours, resulting in a loss of containment integrity while the reactor's fission process was operating.

Vermont Yankee Nuclear Power Corp.
A $75,000 fine for alleged safeguards violations at the Vermont Yankee plant. According to the NRC, the plant's Central Alarm Station Operator failed to respond to an alarm in accordance with the plant's security plan.

COMMENTARY

Competition: An opportunity or long-term threat?

One of the recent developments affecting the electric utility industry has been the recognition of competition as a proper factor in the electric power supply business. No longer is an electric utility's service territory seen as a natural monopoly by opposition forces. State and federal commissions increasingly see competition replacing the rules and regulations that have circumscribed utility operations for decades.

Utility executives have mixed views about competition. Many point out that electric utilities have competed for years against other energy sources.

Others argue that they are ready to compete...against anyone, anytime... but that the playing field should be made level. These see competition, as defined in recent regulatory decisions and position statements, too-often meaning non-utilities are free to go after utility customers and business, but that utilities can't fight back in-kind.

These executives want to have the same freedom to compete with non-utilities for power supply contracts in their own service territories and elsewhere. They want to compete on whatever level is required in return for giving up the protection built into the regulatory contract.

Utility theorists argue that no longer is their a natural monopoly associated with utility service. This is at the heart of the current debate raging over transmission access. Current legislation would give non-customers equal rights with, and in some cases primary rights over those of customers whose rates have paid for the transmission system in question. Clearly, the playing field has been slanted against equal utility competition.

Another, and perhaps even more insidious threat to the sanctity of utility existence, as we know it, comes from offshore. Consider that in recent years, large generation projects have been cooperatively developed. Participants may involve an architect/engineer, equipment manuafacturer, construction company, financial organization and the utility. The first four design and build the plant and the utility operates the plant and has rights to the power produced. In the future, however, all those services may be offered to utility *customers* at very favorable rates by an offshore supplier that is not bound by American utility regulation or anti-trust law.

Consider a company...say one like Mitsubishi of Japan. Here is a giant corporation with a variety of subsidiaries and enormous capabilities: A design/engineering/construction company, a large turbine-generator manufacturing company, a company that makes power delivery and industrial utilization equipmemt, a control systems company and one that is involved in international finance, to point out only a few. As Professor Art Thompson of the University of Alabama observed at the Utility Purchasing Management Group meeting in Denver in mid-September, "Don't you suppose that Mitsubishi just might be able to work out favorable cost/price arrangements between each of its many parts so as to allow it to be the low bidder whenever it wants?"

Certainly a single integrated, multi-functional non-U.S. organization free of all the laws and regulations defining domestic business relationships would be more cost-effective than a loosely formed project-development group of U.S. firms, each of which is seeking to maximize its profit potential. Free of the regulatory rules that limit electric utility operations, it should be able to substantially undercut the utility's charges for energy to prime large customers. Individual utilities could suffer the erosion of large chunks of their profitable core business, leaving them the higher cost-of-service, lower-margin customers. Such utilities can be faced with increasing costs and be forced to seek higher rates, which will make them even less competitive.

There's no question that competition is a fact of life today for utilities. But if they are to be thrown into the competitive arena, then they should be allowed to utilize all possible creative solutions to the problems posed.

If competition is to be the law of the land, so be it. But let's be sure that all competitors...including electric utilities...have the same opportunities and freedoms to compete evenly.

Robert A. Lincicome, Editor-in-Chief

EL&P®

ELECTRIC LIGHT & POWER
1250 S. Grove Ave., Barrington, IL 60010

Arthur L. Rice,
Publisher

Robert A. Lincicome
Editor-in-Chief

PennWell
PUBLISHING COMPANY

708-382-2450
Fax: 708-382-2977

Henry Stein, Senior Editor-Generation
H. Wayne Beaty, Senior Editor-Transmission/Distribution
Mark T. Hoske, News Editor
Jill F. Minner, Special Projects Editor
Dianne Wilson, Editorial Assistant-Products/Literature
B. J. Davidson, Bulletin Board Coordinator
William Kenworthy, Legal/Regulatory Editor
Ted Pollock, Management Editor
Richard D. Alaniz, Labor/Management Editor
Anthony F. Cantarella, Safety/Training Editor
John D. Turrel, Contributing Editor

ELECTRIC LIGHT & POWER (USPS 858-860) is published monthly by the PennWell Publishing Company, 1421 S. Sheridan Road, Tulsa, OK 74112. © Copyright 1991 by PennWell Publishing Company. All rights reserved. Officers of PennWell Publishing Company are Philip C. Lauinger, Jr. Chairman/Chief Executive; Joseph A. Wolking, President; Joseph T. Bessette, Group Vice President; John Maney, Vice President/Finance. Electric Light & Power editorial offices are located at 1250 S. Grove Avenue, Barrington, IL 60010. Phone (708) 382-2450. Distributed to executives and engineers in U.S. electric utilities and consulting engineering firms. Second class postage paid at Tulsa, OK, and additional mailing offices. Subscription: $42 per year (U.S.), $73 (foreign), $118 (foreign air mail). Single issue price: $5 + postage ($8 + postage foreign). Available on the NEXIS® Service, Mead Data Central Inc., Box 933, Dayton, OH 45402; (513) 865-6800. Copies of back issues are available on microfilm from Univ. Microfilm, 300 N. Zeeb Road, Ann Arbor, MI 48103, and on microfiche from Mic[illegible]oto Div. of Bell & Howell, Old Mansfield Road, Wooster, OH 44691. POSTMASTER: Send address changes to ELECTRIC LIG[illegible] POWER, P.O. Box 2680, Tulsa, OK 74101.

BPA ABP

Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

FPC wants to build; plants close; compressed air storage; t-line

Supply/delivery roundup

Florida Power Corp. plans to meet load growth through the 1990s by building 1708 MW of generation, implementing 1445 MW of demand-side management, and purchasing 751 MW of non-utility generation and 400 MW of out-of-state power.

A Polk County site has been selected for the construction of the new plants. Florida Power said it would explain—at the state regulatory hearing to determine the need for generation—that it should build and solely control the 1708 MW of generation, said Mike Foley, Director of System Planning.

"We feel we have a well-balanced generation mix of purchased power, demand-side management, energy efficiency programs and our own power generation," Foley said.

New England utilities ageed to close seven Northeast Utilities (NU) generating units two years early due to slower-than-expected regional demand growth since 1987.

Shutdowns began Sept. 1 on Connecticut Light & Power Co.'s 69-MW Middletown Unit 1 and Devon Units 3, 4, 5, and 6 for 222 MW. Also closed was Western Massachusetts Electric Co.'s West Springfield Units 1 and 2 for 96 MW. All were oil-fired; the units' start dates ranged from 1942 to 1954.

NU had originally planned to retire Middletown and Devon units in early '87. Due to tighter regional capacity forecasts, New England Electric System's New England Power Co. and Commonwealth Electric System's Canal Electric Co. agreed in 1987 to compensate NU for reactivating the Devon units and help pay for operating the seven units for six more years. NEP contracted for 245 MW, about 58 percent of the output; Canal about 17 percent; and NU retained 25 percent.

Even with payments to NU for costs associated with the early shutdown, NEP said it expects customers to save $18 million over 20 months through April 1993.

NU's CL&P and WME also agreed to the shutdowns.

Alabama Electric Cooperative's compressed air energy storage plant, the first in the United States, went commercial, reaching full power generation of 110 MW on natural gas.

The plant stores compressed air in a 19-million-ft^3 salt cavern during off-peak hours and releases it to a gas-turbine generator during peak generation periods. The plant, designed to operate unattended, uses a distributed control system with microwave links to AEC's off-site dispatch center.

Electric Power Research Institute co-sponsored and partly funded the project. Burns & McDonnell Engineers-Architect-Consultants, based in Kansas City, MO, prepared turnkey specifications, helped evaluate bids and serves as AEC's engineer.

Consumers Power Co. said the Federal Energy Regulatory Commission denied a rehearing request contesting the interconnection agreement between CP and PSI Energy Inc. of Indiana. David V. Voigt, CP's vice president of electric transmission, called the denial "an important step" toward commercial operation for the 345-kV line by 1993. CP is still acquiring land for its $125-million, 60-mile portion of the project, and needs state regulatory approval.

Michigan Residents Against Giant Energy Inc. (RAGE) and the Michigan Municipal Cooperative Group (MMCG) were intervenors. MMCG wants "joint utility planning and transmission-line ownership to address Electric and Magnetic Field (EMF) concerns by minimizing the number of transmission lines needed."

Survey cites 104,201 MW in bids in 7 yrs

WASHINGTON—In the past seven years, there's been 1344 supply-side bids for 104,201 MW of capacity. Forty-two solicitations had winners totalling 315 projects, for 11,946 MW.

Capacity in the request for proposals (RFPs) exceeded capacity sought from 1.5 to 42 times, for an average response of 10 times what was sought.

These figures, from a National Independent Energy Producer (NIEP) study, shows the popularity of bidding in recent years as a method of procurement.

Since 1984, 36 states have adopted or are considering adopting bidding guidelines, the NIEP study said. In states without bidding rules, 12 investor-owned utilities issued 17 RFPs.

In addition, three municipal utilities, four public power agencies, seven rural electric cooperatives, and three government entities have issued RFPs.

Virginia was named the largest bidding market. Virginia Power sought more than 4100 MW, 1986-90.

The study, "Competing for Power: A Survey on Competitive Procurement Systems and Blueprint for the Future" was assembled with NIEP staff, a review panel and Hope Robertson, the publisher of *Robertson's Current Competition* newsletter.

Natural gas and coal technologies account for 8266 MW, or 68 percent of megawatts awarded as of May 1, 1991.

Renewables, including hydro, geothermal, resource recovery, wood and other biomass, account for 2106 MW or 16.8 percent. (The table percentage differs due to "Other" designation.)

"Independent electric power generators, such as companies which make up the National Independent Energy Producers, have brought 50 percent of all new capacity since 1989," said Robert T. Sherman Jr., NIEP vice chairman and vice president of Cogen Technologies Inc. of Houston, TX.

Fuel Mix of Awarded Bids (%)

Natural Gas	46.2
Oil	2.8
Coal	21.8
Renewables*	17.3
DSM	1.9
System Sales	3.3
Other	6.7
Total	100.0

*And municipal waste

Of 172 of these projects chosen by utilities and state regulators through bidding, more than 85 percent, almost 9300 MW, were successfully under development, under construction or operating, Sherman noted.

For more information contact NIEP, 601 13th St., NW, Ste. 320S, Washington, DC 20005; phone 202/783-2244.

Correction

EL&P, 9/91, p.18, incorrectly named Boston Edison Co. as a utility that had upset some bidders by choosing less capacity than originally planned from a demand-side request for proposals. New York State Electric & Gas Co. was the utility.

1991 6-month financings lag 6% behind 1990

ATLANTA—Investor-owned electric utility financings for the first six months of the year barely topped $4 billion, 5.55 percent less than the same period in 1990, $4.24 billion, according to Ebasco Service Inc.'s "Analysis of Public Utility Financing."

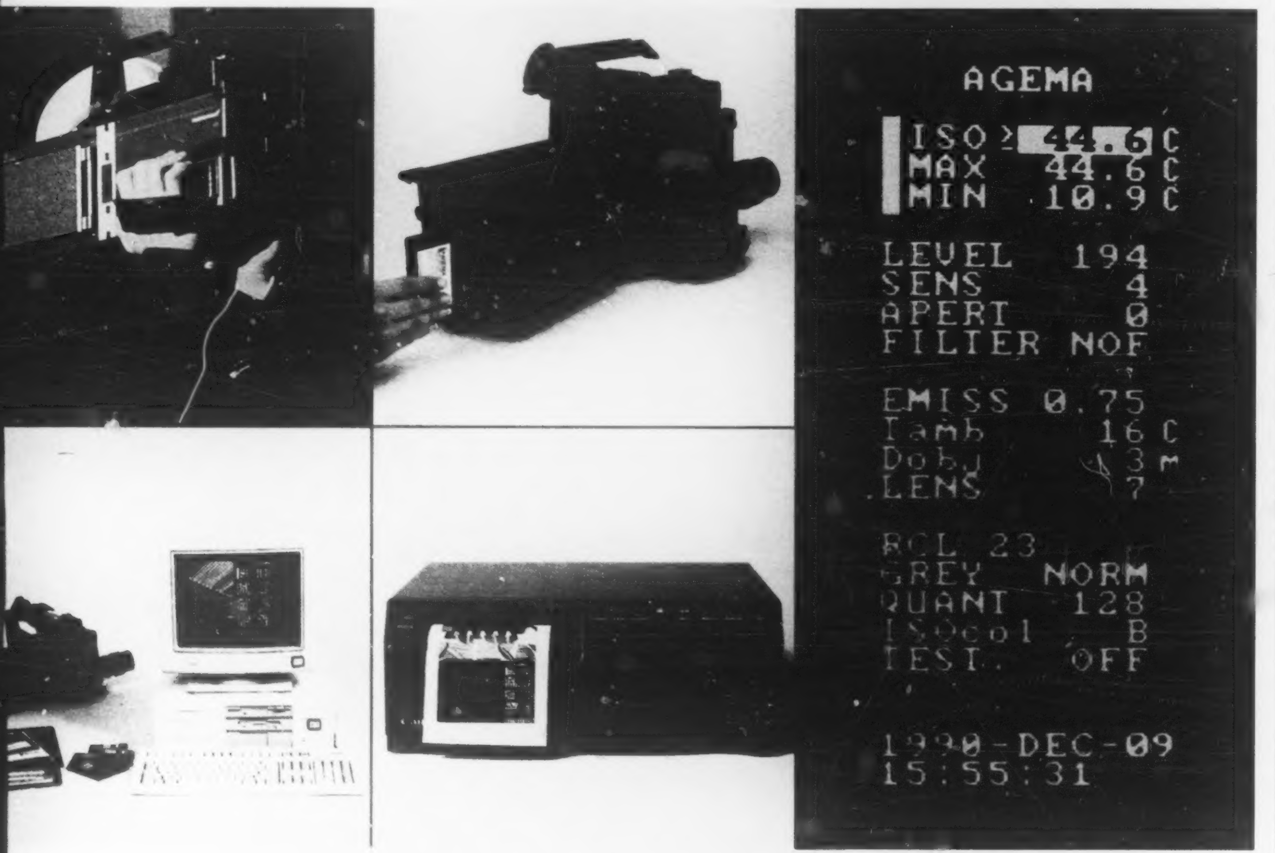
Refundings, 35 percent of the total at $1.4 billion, increased by 17 percent over 1990. New money accounted for 65 percent of the financing, compared to 72 percent last year (see table).

Long-term debt made up 74 percent of the total, compared to 97 percent last year. Preferred stock made 8 percent of the total, up from just 2 percent; common stock increased to 18 percent of the total, up from just 1 percent.

Offerings of Securities by Investor Owned Public Utility Companies ($000)

	January 1, to June 30, 1991 Electric	% of Total	January 1, to June 30, 1990 Electric	% of Total	6 Months Change '90 - 91
Long Term Debt	2,951,330	74	4,130,836	97	-29
Preferred Stock	315,000	8	75,000	2	320
Common Stock	738,476	18	34,125	1	2064
Total Financing	4,004,806	100	4,239,961	100	-6
By Type of Sale					
Public	3,829,806	96	4,143,961	98	-8
Private	175,000	4	96,000	2	82
By Purpose of Sale					
New Money	2,603,806	65	3,039,961	72	-14
Refunding	1,401,000	35	1,200,000	28	17
By Method of Sale					
Competitive	1,075,000	27	1,280,000	30	-16
Negotiated	2,754,806	69	2,863,961	68	-4
Private	175,000	4	96,000	2	82

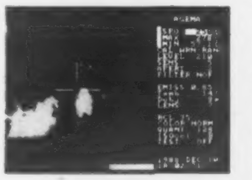
Source: EBASCO Services Inc.



When you buy an infrared scanner for predictive/preventive maintenance, you deserve a lot more than just a pretty picture.

You should also get the measurement data, field recording and analytical capabilities and report preparation software that only Thermovision® infrared cameras can provide.

We're not suggesting that you shouldn't look for a high definition image when you select an infrared scanner. We'd just like to point out that you should expect a lot more.



Like a measurement data screen that tells you everything you need to know about the image you're looking at. A unique, continuous color scale which offers clearer definition than even the original grey scale. And a built-in floppy disk drive that lets you record and study images on the spot.

You should be looking for a system that lets you display the images from your diskette directly onto your PC. Or software that allows you to enhance and manipulate them for in-depth analysis. You'll also want a program that combines an infrared image and a visual image together with your comments on a single printout

And of course you'll want to have all these features in equipment that is lightweight, easy to learn and operate.

If you won't accept anything less in an infrared system, then welcome to The First Team in Condition Monitoring, because that's the only place you'll find them all—from the industry lightweight, the Thermovision 210, which combines high definition imagery and a freeze frame function in its small frame to the top of the line 400 series, *so well-designed and rugged that its unique SPRITE detector is warrantied for three years!*

For complete information, just contact us at AGEMA Infrared Systems, 550 County Avenue, Secaucus, NJ 07094. 201-867-5390, Fax: 201-867-2191.

And see why, important as it is, image isn't everything.

AGEMA
Infrared Systems

Inquire R.S. 6

Philadelphia Electric decentralizes power; MR looks for merger

One utility is decentralizing, while another seeks to consolidate operations.

Philadelphia Electric Co. decentralized electric and gas utility operations Aug. 9-12, in what it called its "most dramatic organizational transformation in more than 50 years."

The move was to bring operations closer to customers.

Joseph F. Paquette Jr., chairman and CEO, said, "Reorganization represents another step in our strategic plan to change Philadelphia Electric Company into a strong, competitive utility whose emphasis is on achieving superior customer satisfaction."

The move gives division general managers direct responsibility and accountability for quality and reliability of electric and gas distribution and for satisfying customer needs, concerns and complaints. These have been centralized at PE since prior to WWII.

Customers were notified of the realignment in various ways, including letters and individual notices from division general managers, bill inserts and briefings from community affairs and customer operations personnel.

An internal review prompted the changes, PE noted.

Consolidation sought

Midwest Resources, based in Des Moines, IA, announced intentions to merge utility operations of Iowa Power, IPS Electric and the gas service of Midwest Gas under Midwest Resources for operating efficiencies and financial savings.

The merger depends on approvals from state regulators in Iowa and Minnesota, the Federal Energy Regulatory Commission, and preferred shareholders of Iowa Power and Iowa Public Service Co.

Move anticipated

The move was anticipated following the previously reported merger of Iowa Resources and Midwest Energy, the holding companies of the two electric utilities.

Top 100 corrections

BARRINGTON, IL—Changes and corrections must be made to the Top 100 report printed in the August issue (pp.17-21).

The 1990 heat rate in Table 6 for Atlantic Energy was actually 10,602 Btu/kWh, which moves the utility to the No. 48 position in the table.

In Table 4, Colstrip-1 drops out of the list, since its correct heat rate was above 10,000 Btu/kWh. Thus, Comanche Power-1 becomes the No. 1 unit.

American Electric Power's Cardinal-1 and Big Sandy-2 become Nos. 3 and 4 (after renumbering the table) with heat rates of 9049 and 9061 Btu/kWh, respectively. New England Electric's Brayton-3 unit, with a heat rate of 9174 Btu/kWh, becomes No. 6. New York State Electric & Gas' Somerset-1 becomes No. 9 at 9228. AEP's Clinch River-2, Cardinal-2 and Big Sandy-1 become Nos. 14, 17 and 18, respectively, with rates of 9266, 9303 and 9305.

In Table 5, Commonwealth Energy, with a heat rate of 9614 Btu/kWh, should be added in as No. 2 (after renumbering); American Electric Power, at 9646, as No. 3; and Detroit Edison, with a rate of 9793, should be added in as No. 4. Florida Progress's heat rate was really 9821 Btu/kWh, moving it up to No. 6.

GENERATION UPDATE

HENRY STEIN, Senior Editor-Generation

NRC is thoroughly investigating failures at Nine Mile Point Unit 2

Henry Stein
Senior Editor—Generation

A second, more in-depth Nuclear Regulatory Commission probe into Aug. 13 failures, control-room blackout and emergency shutdown at Nine Mile Point nuclear Unit 2 could reveal equipment or design flaws that might lead to changes in similarly designed plants.

The NRC said it upgraded the Nine Mile Point investigation because of the potential implications of multiple failures of power supplies on other reactor facilities with similar configurations. The in-depth probe was to concentrate on a detailed review of the electrical systems design, equipment response to the electrical disruption, and challenges the electrical system failure placed on the operating personnel.

Niagara Mohawk agreed not to restart the plant until receiving approval from the administrator of NRC's Regional Office at King of Prussia, PA.

As of mid-August, the 1705-MW, two-reactor plant on Lake Ontario near Oswego, NY, was still in a cold shutdown condition, even though there had been no damage to fuel or release of radioactivity.

The NRC originally sent a seven-member Augmented Inspection Team (AIT) to the plant. That team's investigation prompted NRC's James Taylor, executive director for operations, to form a more specialized investigative group, an Incident Investigation Team (IIT). The IIT went to the plant to assure that the commission gets "a more thorough understanding of what happened at Nine Mile Point," according to Taylor.

What did happen at the plant

At 5:48 a.m. on Aug. 13, Transformer 1B faulted internally due to unknown causes. This caused a power surge that tripped the main turbine and initiated a scram for the boiling-water reactor.

When normal station power automatically transfered to reserve power, several uninterruptable power supplies failed. These failures resulted in loss of control room annunciators, instruments, computers and lighting.

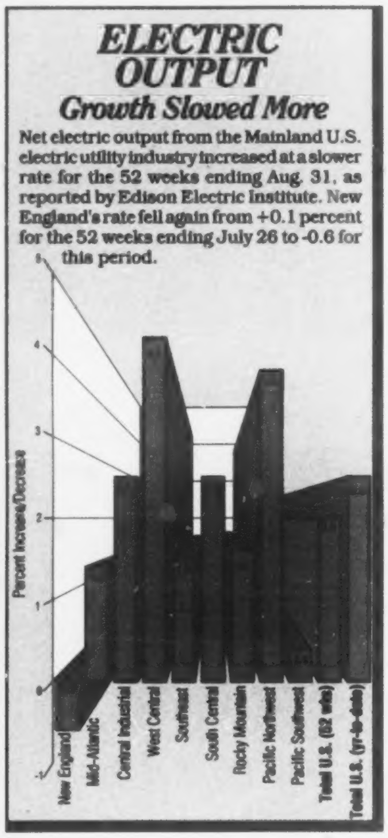
Because of the control room losses, the operators could not directly control the unit, verify that the reactor protection system had actuated, nor that control rods had automatically inserted to shut down the reactor. Using independent instrumentation, operators monitored the unit and, as a precaution, manually scrammed the unit's reactor.

Plan worked, but...

The AIT investigation found the emergency plan had been effectively implemented and emergency responses taken were adequate to protect public health and safety. In recognition of this, B. Ralph Sylvia, executive vice president of nuclear operations for Niagara Mohawk stated, "I am very pleased with the response of our people and those who assisted us in our emergency plan."

However, NRC's Taylor said that several aspects of the power loss required closer examination to assure understanding of generic technical and operational implications, so he formed and dispatched the IIT.

An AIT focuses on licensee performance, noted the NRC. An IIT, conversely, concentrates on generic implications, including adequacy of regulatory requirements and guidance. In this case, the IIT is closely examining the loss of five uninterruptible power supplies and emergency lighting in some parts of the plant.

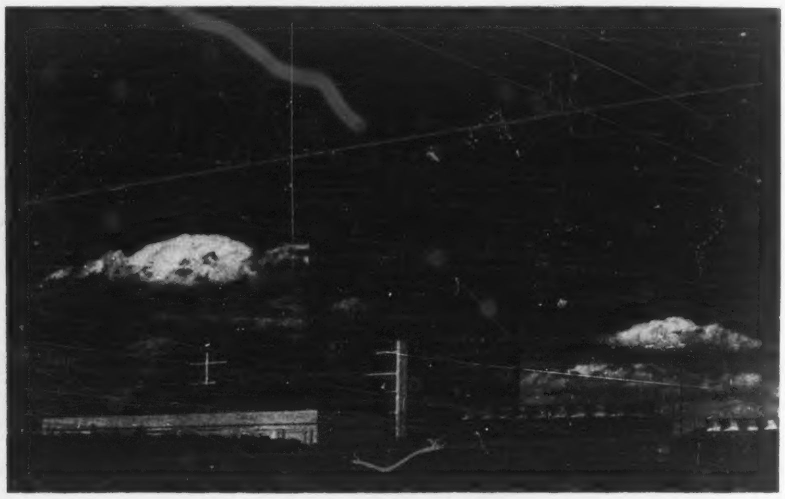

ELECTRIC OUTPUT
Growth Slowed More
Net electric output from the Mainland U.S. electric utility industry increased at a slower rate for the 52 weeks ending Aug. 31, as reported by Edison Electric Institute. New England's rate fell again from +0.1 percent for the 52 weeks ending July 26 to -0.6 for this period.

Navajo owners agree to limit SO_2 emissions sharply

PHOENIX—Owners of the Navajo Generating Station have signed a Memorandum of Understanding to install flue-gas scrubbers to help reduce haze in the Grand Canyon. The scrubbers will be able to remove 90 percent of the sulfur dioxide emitted by the plant, and the first of three must begin operation by Nov. 19, 1997; the last by Aug. 19, 1999.

The agreement was announced by Governor Fife Symington of Arizona on Aug. 8. In announcing the Memorandum, he stated, "Salt River Project, the Grand Canyon Trust and the Envi-

Continued on page 22



The Navajo Generating Station will have $430-million worth of scrubbers added to its stacks to reduce SO_2 emissions that are blamed for part of the haze problems in the Grand Canyon.

World nuclear events may hurt future U.S. programs

WASHINGTON—Things are happening in other countries that may have a profound effect on how electricity is produced in this one. But the pictures from abroad are not always clear.

Just hearsay?

The first inkling of problems came from stories about safety from recent Cuban refugees who had worked on the Soviet-built reactors in that Caribbean country, as reported in the British publication *Electrical Review*.

If anything catastrophic did take place with the Cuban nuclear plants, it would almost certainly put another long delay into any plans for nuclear usage in the U.S., if not kill some plans entirely for the foreseeable future—even more so than the incident at Chernobyl. The U.S. would be the first and most severely impacted country, after Cuba itself, to receive any radioactive fallout.

Senate hearing

Consequently, on July 25, the U.S. Senate Subcommittee on Nuclear Regulation held a hearing about the nuclear plant situation in Cuba, Eastern Europe and the USSR.

In testimony before the subcommittee, Senator Bob Graham (D-FL) stated, "Nuclear safety is an international issue...An accident at any reactor in any country can affect the health and economy of other countries."

The senator described two Cubans who had worked at nuclear power plants under construction there and had recently defected. One was a geologist and the other a quality control inspector for welds. They reported *significant* deficiencies in materials and construction practices.

Graham said the United States should "support and encourage international effforts to inspect the Cuban plants" and "international technical assistance to Cuba so that the plants are built and operated safely."

Soviet design shortcomings

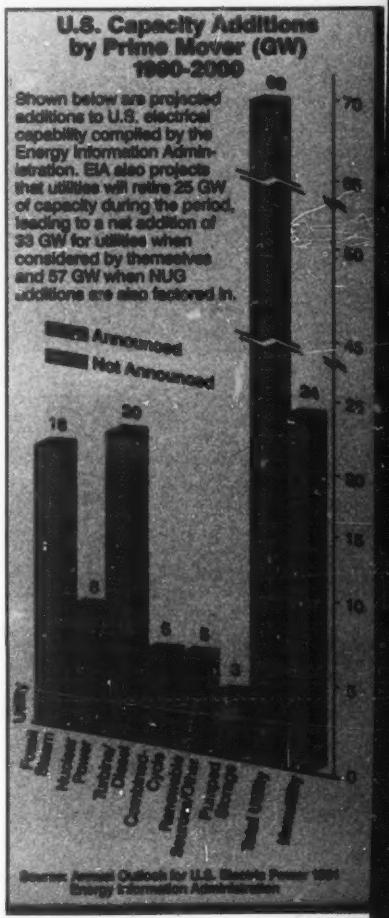
He then switched the subcommittee's attention to the Soviet-design reactors in the Soviet Union and Eastern Europe. He pointed out the lack of basic safety features and equipment, and the poorly trained operating personnel.

Graham noted that problems in design, construction and operation of four reactors in Bulgaria were so bad that the International Atomic Energy Agency (IAEA) recommended they be shut down, which he declared was an unprecedented step for the IAEA. He also reported that the four reactors of similar design in the former East Germany were shut down soon after German reunification because of safety concerns, and the Soviets themselves closed down two more in Armenia. (*EL&P*, 6/91, p.26)

A visitor's viewpoint

William S. Lee, chairman and president of Duke Power Co., first chairman of the Institute of Nuclear Power Operations and first president of the World Association of Nuclear Operators, reported to the subcommittee on his October 1989 visit to the Juragua Nuclear Station in Cuba, which was under construction, and to "a number of laborato-

Continued on page 20


U.S. Capacity Additions by Prime Mover (GW) 1990-2000
Shown below are projected additions to U.S. electrical capability compiled by the Energy Information Administration. EIA also projects that utilities will retire 25 GW of capacity during the period, leading to a net addition of 33 GW for utilities when considered by themselves and 57 GW when NUG additions are also factored in.

Source: Annual Outlook for U.S. Electric Power 1991 Energy Information Administration

1991 Electric Utility AM/FM report shows strong market

ROSEVILLE, CA—CSR Inc.'s 1991 Electric Utility AM/FM report lists a total of 234 projects valued at over $465 million.

The projects will be bid over the next 30-month period from July 1991 through December 1993.

The report includes detailed information about both new projects as well as additions to existing systems (see table).

Data was obtained from over 1300 utilities throughout the U.S. and Canada during the study which was conducted from March to July.

The report also contains an overview and analysis of the market, including size and trend information, market segment analysis, and leading vendors' market share.

AM/FM projects scheduled through 12/93:

	New Projects	Updated Projects	Total Projects	Project Cost
Systems	83	151	234	$107,357,000
Hardware/Software	92	63	155	60,584,000
Conversion	109	103	212	298,815,000
Consulting	22	16	38	2,595,000

Ten tables in the report includes the following data:

- System projects listed alphabetically by utility name, chronologically by specification release date, by budget size, and by state/province.
- Conversion projects listed alphabetically by utility name, chronologically by specification release date, by budget size, and by state/province.
- Hardware/software add-on projects.
- Consulting projects.

Electronic version

An electronic format of the report permits tracking the progress of projects and performing customized sorts and queries using a PC. The data are a subset of the master database and uses dBase III software.

For additional information, contact: CSR Inc., One Sierragate Plaza, Suite 270-C, Roseville, CA 95678; Ph. 916/773-3344; fax 916/773-4388.

System reads meters in remote locations

LAFAYETTE, IN—Landis & Gyr agreed with Equimeter Inc. and Sensus Technologies to develop the TouchRead remote meter reading capability for the electric utility industry.

TouchRead provides hard-to-read meters with a remote reading communications port called a TouchPad. The meters are then read by touching the tip of a reading gun to the remote pad. The meters are instantly interrogated and the readings electronically transferred in less than 2 sec to a handheld reading terminal.

Landis & Gyr will develop an encoder register for its electric meters. When interrogated, the electronic register will output an ASCII message containing the meter kWh reading, serial number and tamper indication.

The TouchRead meters can be upgraded to automatic meter reading.

NIPSCO installs fault-tolerant EMS

MAYNARD, MA—Northern Indiana Public Service Co. plans to install the first *fault-tolerant* SCADA/EMS (Supervisory Control and Data Acquisition/Energy Management System).

The system will be based on Digital Equipment Co.'s VAXft fault-tolerant platform and will be integrated and installed by the Utility Automation Unit of Johnson Yokogawa Corp., Carrollton, TX.

The fault-tolerant system, which has online upgradability, means no system downtime and continuous processing with no loss of work-in-progress during system maintenance.

The system can detect, isolate and bypass a fault without human intervention, significant delay in service, significant reduction in performance, loss of work submitted by users, or loss of data integrity.

The system implements redundancy through fully duplicated hardware, including processor modules, memory and disk storage, and Ethernet links. It is designed for immediate response to any component failure to ensure no disruption of computing operations or interruptions of NIPSCO's ability to supply electric power to customers.

"Demands for EMS computers are increasing," said NIPSCO Director of Operations Robert Kramer, "and we're seeing a tightening of power generation and transmission funding and anticipate more demand for electricity in the future. The question is how to assure continued power quality and reliability to the customer."

William Tweddle, who heads Johnson Yokogawa's Utility Automation Unit said, "Fault-tolerant computing is a logical outcome of advanced technology. It replaces the traditional dual-redundant configurations we've been using for over 20 years to deliver higher levels of availability."

IT ONLY TAKES A FEW MILLISECONDS TO FULLY APPRECIATE BATTERY ENERGY STORAGE SYSTEMS.

With a battery energy storage system (BESS), the response to fluctuations in demand is virtually instantaneous. The result: greater system stability.

BESS can help defer the costs of new transmission and distribution equipment by increasing the load factor of your intermediate generators or by storing energy near the load.

It's easy to site BESS almost anywhere. For example, it can be placed within a utility plant, or remotely in a high demand area.

Save fuel. Improve system efficiency by letting BESS provide spinning reserve. At the same time, your generator can operate at its most efficient loading.

No noise. Virtually no emissions. Completely recyclable materials. BESS can be very good for the environment.

Keep your cool at peak demand. BESS can be recharged at night and discharged during the afternoon.

BESS is modular; simply add lead-acid battery modules to meet demand in local areas. It's much easier than adding transmission towers.

To be precise, we'll need about 1/30 of a second. It only takes a single cycle for a battery energy storage system (BESS) to respond to demand. It doesn't take much longer to appreciate the other benefits of battery energy storage technology either.

To find out about all the ways that BESS can help you, call us at 1-800-551-BESS for more information and a copy of our brochure before another millisecond slips by.

ENERGY MANAGEMENT CONSORTIUM

ASARCO Inc. Cominco Ltd. The Doe Run Company Johnson Controls Inc. Noranda Sales Corporation Ltd. Boliden M.I.M. Holdings Ltd. Pasminco Metals Pty. Ltd. Yuasa-Exide
The Energy Management Consortium, P.O. Box 12036, Research Triangle Park, NC 27709 1-800-551-BESS

Inquire R.S. 17